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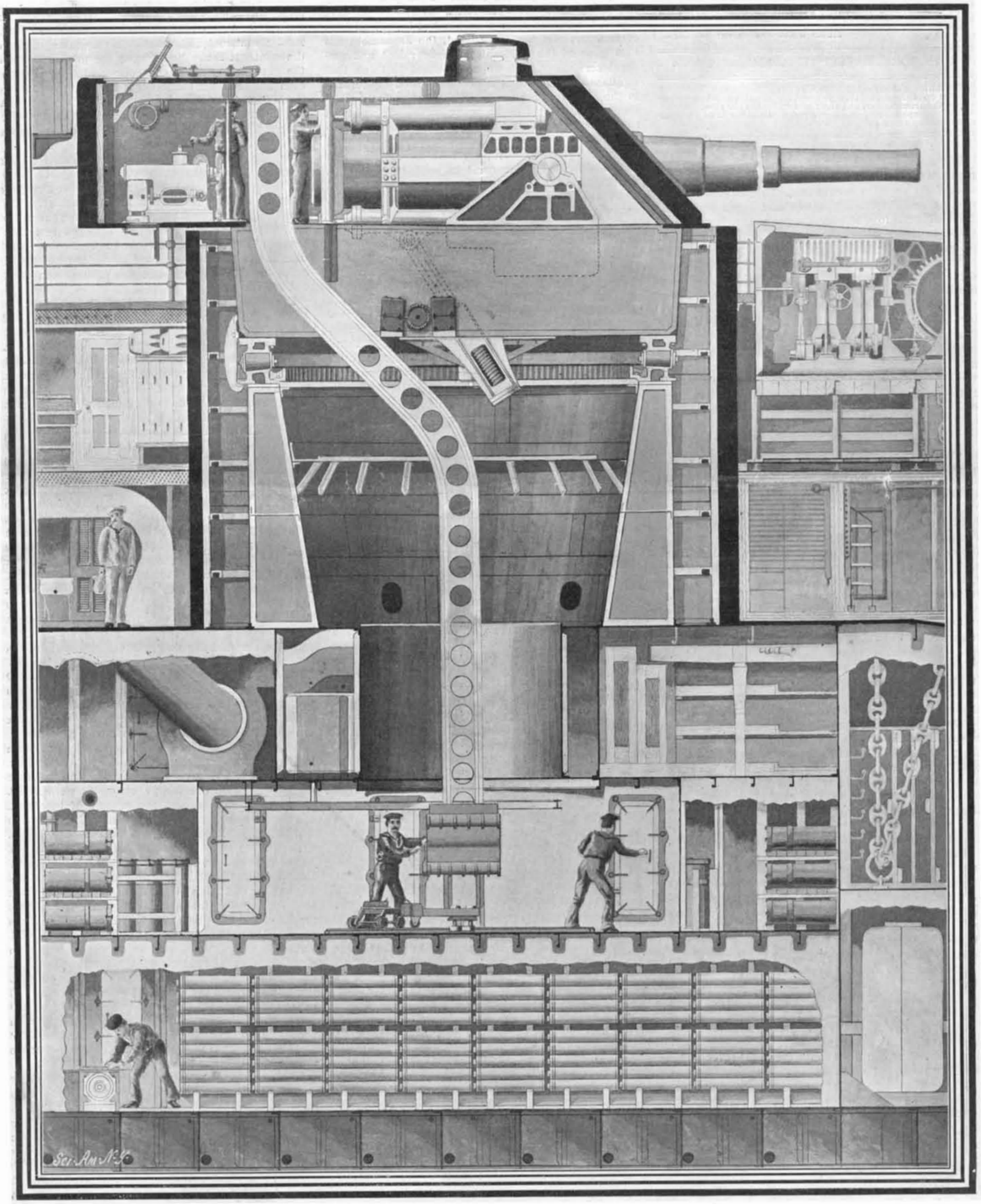
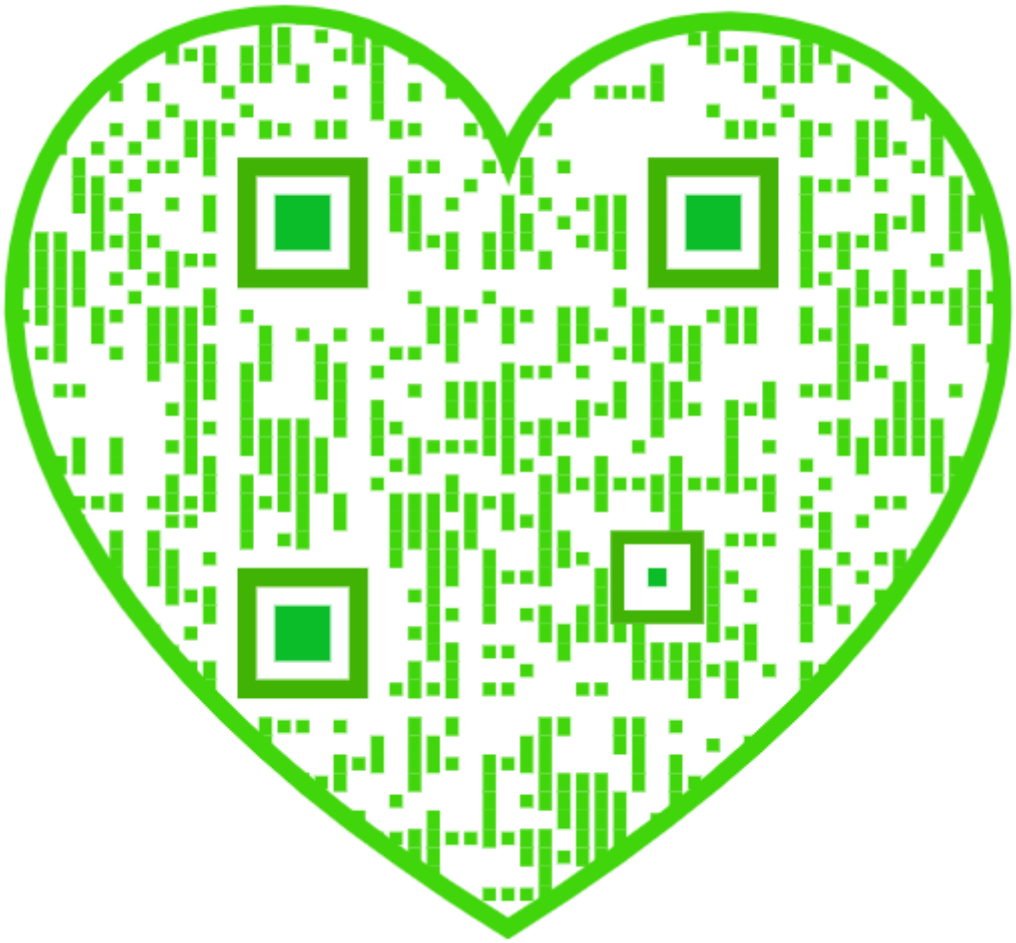


VERTICAL SECTION THROUGH A UNITED STATES BATTLESHIP, SHOWING MAGAZINES, BARBETTE AND TURRET.—[See page 103.]



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NEW YORK, SATURDAY, FEBRUARY 4, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

GAS-DRIVEN LOCOMOTIVES AND SHIPS?

The great advance that has been made during the past ten years in the development of the gas engine, and of its valuable counterpart, the gas producer, is making possible the application of the gas engine in fields of work to which, a few years ago, it was supposed to be quite inapplicable. So long as this type of motor was dependent upon the use of gas that was produced in a large stationary plant, nobody thought of applying it to any uses except those that could be served by a stationary engine. In the early days, when the Otto gas engine was making its plucky and successful fight to establish itself as a useful prime mover, and when only units of small horse-power were needed, if anyone had suggested the application of the gas engine to the locomotive or the steamship, he would have been called an enthusiast and a dreamer; yet to-day, thanks to the broad hint that has been offered by that brilliantly successful invention, the automobile engine, we are unquestionably within measurable reach of the time when we may see the gas engine applied both to the locomotive and the large ship. The automobile proved that the gas engine could be applied successfully to transportation, at least in units where the power was of limited size. But it was early evident to inventors that if trains were to be hauled and steamships driven by gas engines, means, compact and economical, must be found for producing the gas continuously as it was needed in a plant that was carried with, and formed practically a part of, the gas engine. It was realized, moreover, that if this prime mover was to be applied generally to railroad and marine transportation, its gas producer must be capable of handling the common grades of coal, that is to say, of taking the "run of the mine" just as readily as does the steam boiler.

Of course, much yet remains to be done in the perfecting of such gas producers. Some excellent designs have been brought out that show economy superior to that of the best steam engines, *provided they are supplied with fuel of good quality.* But there is much to be accomplished before the producer has been brought to the point at which it will take the cheaper grades of coal, such as are consumed with excellent economy under the steam boiler of to-day. As soon as it has been brought up to the desired point of efficiency when using low-grade fuels, we may look for no little activity in the development of a self-contained producer and engine plant for the operation of locomotives and large steamships. In the current issue of the SUPPLEMENT will be found an interesting study of this problem, as worked out on a United States warship and on the largest of the German transatlantic liners. In the latter case, the saving of space would be very striking. The four big smokestacks would literally "go by the board." One complete battery of boilers would be dispensed with, and the large amount of space between decks, now occupied by the uptakes, would become available for greatly-needed passenger accommodations. If the substitution of gas for steam should become widespread, we would have to make a rather sweeping revision of our glossary of terms. The steam locomotive might be renamed, without offense, "the gas locomotive;" but could the public ever bring itself to the point of calling the magnificent high-speed steamer of to-day a gas-ship?

CAN THE PORT ARTHUR FLEET BE RAISED?

The latest advices from the Far East would seem to indicate that the final surrender of Port Arthur was somewhat precipitate. It is at the conclusion of a war, or of some decisive battle therein, that various side lights, in the way of letters and interviews from the principal actors, are thrown upon important events which hitherto have been subject to the censor's blue pencil. This has occurred in the case of Port Arthur; and it begins to be pretty evident that if the judgment of many of the prominent officers connected with the siege had prevailed, the final capitulation would have been delayed for several weeks longer. If the surrender was precipitate, it may well be that many of the precautions, ordinarily taken before the surrender of a fortress, in the way of the destruction of the war material were, in the hurry of the moment, overlooked, or only partially carried out. In view of this contingency, it becomes quite possible that the Port Arthur fleet, which at the time of surrender was resting half submerged upon the bottom of the harbor, was not so completely wrecked by the Russians as to render its salvage by the Japanese impossible. In a recent interview, one of the paroled officers of the Russian navy has stated that, before the terms of capitulation were signed, the sunken ships were wrecked beyond all hope of recovery. On the other hand, the Japanese claim that some of the battleships can be raised and rendered serviceable, and we are inclined to think that the Japanese version is nearer the truth. According to the Russian account, heavy charges of high explosive were detonated in the boiler rooms, engine rooms and shaft tunnels. If this was done, it is difficult to believe that it was done effectually, since the charges, to properly do this work, must have been placed in carefully-chosen positions and in very large amounts. In view of the fact that the ships were submerged and under fire, this would be a particularly difficult task, and would require an elaborate equipment of divers and mining apparatus, which, in the disorganized condition into which the navy seems to have fallen, can scarcely have been available.

Should it turn out that the ships have suffered no other harm than that produced by the shells that sank them, the task of salvage, though difficult, should not be beyond the powers of the Japanese wrecking crews. The ships were sunk chiefly by the 11-inch projectiles from the mortar batteries. They fell, most of them, almost perpendicularly, and it is likely that, with their usual forethought, the Japanese used armor-piercing projectiles, that were not intended to burst on contact, but passed directly through the various decks and out through the bottom of the ship. Hence it is likely that the water entered through several more or less widely-scattered shell holes, and that the damage at each point of rupture does not extend over an area of more than a few square feet. If this be the case, it would be possible, by temporary patching of the inner bottom, to pump out the vessels and float them, one at a time, into the Port Arthur drydock, or possibly tow them directly to the Japanese yards. The extraordinary vitality betrayed by these very ships, after being struck more than once by torpedoes or floating mines, gives a reasonable expectation that the essential structure of the vessels are still intact, and that a few months in drydock and within reach of a machine shop, may see them added to the Japanese navy and available for the first line of defense. Of the five battleships, one, the "Sevastopol," was sunk outside the harbor in 150 feet of water, and she must be considered as permanently destroyed. The others, including the "Retvizan," "Pobieda," "Peresviet," and "Poltava," were sunk inside the harbor, and are only partially submerged. Wrecking operations, therefore, can be carried on from the decks of the ships themselves, and in no case, probably, under a greater head of water than 40 to 45 feet. The most valuable of these ships is the "Retvizan," which was built in 1900 at the Cramps' shipyard in this country, and may still be reckoned as a thoroughly modern ship. The "Pobieda," built in 1900, and the "Peresviet," built in 1898, are also modern battleships that made, on trial, speeds of 19.1 and 18.5 knots respectively, and carry a numerous battery of long-caliber high-velocity guns. The "Poltava" is an older vessel of doubtful value, launched in 1895; her main armament of four 12-inch guns is somewhat obsolete, and her speed is low. If the three former vessels can be salved, they will form a most powerful addition to the Japanese fighting line, and will give them a decided preponderance over any fleet, or combination of fleets, that Russia can place in the Far East, for at least two or three years to come.

WORLD'S AUTOMOBILE RECORDS IN FLORIDA.

It is gratifying to know that the world's record for the mile, against time, which was brought to this country last January, when W. K. Vanderbilt covered the mile, in a 90-horse-power Mercedes, in 39 seconds, will remain here for the present at least, and probably throughout the whole year. In the meet which was held last week on the famous beach at Ormond, Florida, last year's record for the mile was beaten by no less than three different machines. The fastest run was made by H. L. Bowden on a 120-horse-power Mercedes, weighing 2,650 pounds; his time for the mile being 34 1-5 seconds, and his rate of speed 105.26 miles per hour. The next fastest time was made by an English car, a six-cylinder Napier of 90-horse-power, of less than the regulation weight of 2,204 pounds, driven by A. C. McDonald. This machine ran the mile in 34 2-5 seconds, at the rate of 104.65 miles per hour. The third car to surpass last year's record was a steam car of 20-horse-power driven by L. S. Ross, which covered the mile in 38 seconds. The 120-horse-power machine and the steamer were both constructed specially for racing, the former consisting of a frame lengthened to accommodate two standard 60-horse-power Mercedes engines, placed in tandem on a common shaft, and the Stanley steamer being also a special design, modeled on what has come to be known as the "torpedo" lines, which present as little resistance as possible to the atmosphere. The Napier performance will stand as the official record, on the ground that the machine is a stock machine, coming within the prescribed limit of weight; but it must be admitted that the performance of the steam-driven car is one of the most sensational and altogether surprising events of the meet. It shows how largely the greater power of the gas-driven machines is compensated by the more even torque of the steam engine. Of course, much of the high speed of the steamer is due to its light weight, and to the small sectional area presented to the atmosphere. There can be no question, indeed, that on an ideal track, such as this at Florida, and at the high speed at which the trials were made, the air resistance is by far the most important obstacle to speed.

The record for the kilometer remains in Europe, at least for another year. The Napier machine, with a record of 23 seconds for the distance, being the nearest that any of the racers came to Rigolly's remarkable time of 21 2-5 seconds, made in 1904. In the Florida time trials, the double-engined Mercedes made the distance in 23 3-5 seconds, and the steam-driven car in 24 1-5 seconds.

Unquestionably the most meritorious feat in the time trials was the run of five miles by the Napier car in 3 minutes and 17 seconds, which is 14 1-5 seconds faster than the record made by Vanderbilt in a 90-horse-power Mercedes last year. It works out at an average of 39 2-5 seconds for the mile, or 91.37 miles per hour. For the complete details of the various time trials and races, reference is made to the illustrated article given elsewhere in this issue.

OUR EXPORTS.

Exports of manufactures in the calendar year 1904 exceeded $500,000,000 in value. Details of eleven months' exports just completed by the Department of Commerce and Labor, through its Bureau of Statistics, show for the eleven months of the present year a total of $459,575,023 of manufactures exported, and for the month of November alone $46,608,896; so that, unless the December exports should prove much less than those of November, the total exports of manufactures for the calendar year must exceed 500 million dollars.

In the calendar year 1903 the exports of manufactures were but 421 millions; in 1900, in which year the highest export record in manufactures occurred, the total for the calendar year was 441 millions; in 1898, 308 millions; in 1896, 253 millions; and in 1894, 178 millions. Thus the exports of manufactures in 1904 seem likely to be nearly three times as great as those in 1894. The increase in the exportation of manufactures has been sufficient to nearly offset the phenomenal reduction in exports of agricultural products.

As is well known, the shortage in our own wheat supply, coupled with the unusual demand in the home market and the unusually large surplus in other countries from which our former customers were able to draw freely, have caused the exports of breadstuffs from the United States, and especially those of wheat and flour, to fall off greatly in the last year, so that agricultural products which, in the eleven months ending with November, 1903, amounted to 789 million dollars in value, were but 704 millions in the corresponding months of 1904, a fall of 85 millions; while manufactures show an increase of 77 millions, the figures for the eleven months of 1903 having been 382 millions, and in eleven months of 1904, 459 millions. In addition to this, products of the mines show an increase of about 3 millions, products of the forests 3 millions, and products of the fisheries 1 million dollars; while the miscellaneous group shows a decrease of about 1 million dollars and foreign merchandise exported a decrease of nearly 2 millions, bringing the total exports for the eleven months of 1904 up to $1,306,173,292, against $1,309,933,517 in the corresponding months of 1903.

On the import side the total importations for eleven months are $939,381,659, against $917,725,693 in the corresponding months of last year. The fact that the imports for the single month of November, 1904, were $95,208,172 seems to justify the statement that the total imports for the calendar year will be over one billion dollars. The greatest increase in imports occurs in articles of food, chiefly sugar and coffee, which divide honors about equally in the increase in imports of foodstuffs. The other group showing an increase is "articles in a crude condition for use in manufactur-

ing," which for the eleven months ending with November, 1904, showed a total of $309,338,579, against $293,439,440 in the corresponding period of last year. The other groups, "articles wholly or partially manufactured, for use in manufacturing," "articles manufactured ready for consumption," and "articles of voluntary use, luxuries, etc.," show in each case a slight decrease as compared with last year, the figures being: Articles wholly or partially manufactured, for use in manufacturing $122,122,187, against $140,845,440 in the eleven months' period of last year; manufactured articles ready for consumption, $145,110,133, against $159,872,017 in the same period of last year; and articles of voluntary use, luxuries, etc., $122,184,867, against $130,252,185 in the eleven months of 1903.

FOAMING OF THE WATER IN A STEAM BOILER AND ITS EFFECT.

BY CHARLES H. HASWELL, C.M. AND N. E.

There is not an element in the effective and economical operation of a steam boiler and attached engine, whether in land or marine service, and especially in the latter, that is pregnant with more results and casualties than the foaming, or "priming" of it (the latter a foreign term neither expressive nor derivative), inasmuch as it involves not only the wasted expenditure of heated water, by its flowing with the steam of operation into the cylinder of an engine; but, when its volume is in excess of that of the clearance space between the piston and the head or bottom of the cylinder, it involves the disruption of one of them. Upon the resulting arrest of the engine and consequent flow of steam to it, the foaming water, except when violently agitated by the motions of the vessel in which it is operated, subsides, and if its surface is below the upper surface of the furnace tubes or flues, as the case may be, it soon renders them incandescent, and as the result a collapse may ensue.

Before essaying to submit a remedy, or even an amelioration of this objectionable and destructive operation of foaming, it is proper to consider its origin. Ordinarily, it is the result both of an insufficient height and volume of steam space above the water line, and the *per saltum* flow of steam to the engine, consequent upon the periodic operation of the steam valves, which involves such undulations of the surface of the water that foaming ensues. It also occurs when the area of the surface of the water is less than that of the area over the crowns of the furnace.

With boilers where foaming exists, various expedients are resorted to, either to obtain additional volume of steam space by the addition of a cylindrical vessel, arranged as an integral of the boiler or attached to it, termed the drum, or by concentric cylinders set vertically at the termination of the flues or tubes, and rising to an elevation so far above the water level as to give space for the foaming water to subside before reaching the opening of the steam pipe. Upon this construction the smoke pipe is set, and the hot air from the furnace rising through the inner cylinder or chimney superheats the steam within the ring to an effective and economical degree. Another method is to extend the steam pipe into the boiler and attach it to the under side of the crown of the shell. The pipe is perforated with numerous small openings, and the steam, instead of flowing in a mass to the opening of the steam pipe, flows in minute currents from an extended surface, and foaming is materially arrested. This construction is termed a dry pipe.

Foaming renders it difficult, furthermore, to readily ascertain the actual height of the water in a boiler; and as the removal or correction of this difficulty is imperative, various devices in addition to the ordinary gage cocks of manual operation are used, such as a glass gage attached to the front of a boiler and connected to it, both above and below the upper surface of the flues or tubes by small connections, which arrest and reduce the foaming to a degree that shows the actual height of the water. Sometimes a metallic cylindrical vessel with a glass face is used, connected in like manner.

The loss in the cylinders from the super-hydrated steam due to foaming water is a material element in the question of the economy of a steam engine. The conditions, results, and constructions here detailed are well known, and they are introduced, not only as a record of the construction of the period, but to give value to the following illustration of a very common and effective cause of foaming in all boilers, and how it can be materially prevented.

In the operation of the furnace of a boiler, the heated water contiguous to the outer sides of it rises in vertical currents to the water line, and in a boiler where the water line is less in width than the extreme width of the furnaces, the ascending of currents of water in the condition of ebullition will be concentrated at the water line between the sides of the boiler and furnace; and hence a concentrated ebullition of the surface of the water or foaming much in excess of that which arises from the ordinary want of steam space will ensue, which in small marine vessels, where the height under the deck is insufficient to admit of a drum, chimney, or like construction, is irremediable.

PASSAGE OF THE TRADE-MARK LAW BY THE HOUSE OF REPRESENTATIVES.

In our issue of January 14 we published an article by Mr. Arthur P. Greeley, late Assistant Commissioner of Patents, reviewing the bill presented by Mr. Bonynge (H. R. 16,560) for the relief of present trade-mark conditions. The House of Representatives has passed this measure. It must now be considered by the United States Senate and receive the President's signature before it becomes a law.

The main object sought to be accomplished by the bill, as pointed out by Mr. Greeley, is the registration of trade marks used in interstate commerce as well as those used in foreign commerce and in commerce with the Indian tribes; the formulation of a procedure which will give uniformity to the laws governing the registration of trade marks; the provision of additional penalties for the infringement of a registered trade mark; the reduction of the fees required on the filing of an application for the registration of a trade mark; the regulation of the procedure for the registration of a trade mark governing cases of interference or conflicting claims to the use of trade marks; the fulfillment of our treaty obligations with foreign governments.

Among the sections of the bill containing provisions differing from those of the present law, may be mentioned the first, which provides for the registration of a trade mark in use in interstate commerce, a provision that is sadly needed. Section 3 provides that if an applicant for registration is not domiciled in the United States, he must appoint some person who is a resident of the United States upon whom process may be served. Another important section is the fourth, which states that if a trade mark has been registered in this country, it shall have the same force and effect here as if filed here on the date of filing abroad, no certificate being issued in this country until the certificate has issued abroad.

In section 5, which has passed almost in the exact words proposed by Mr. Greeley, when he was a member of the Trade-mark Committee, the most important division is that giving full protection to common-law trade marks by providing that nothing shall prevent the registration of any mark in actual use as such for ten years. The sixth section provides for the giving of notice in the Official Gazette of contemplated registration, so that rival claimants to the same mark may file notice of their own titles.

The period of registration, according to the Bonynge bill, is twenty years, except that in case of foreign registration the registration in this country will cease with foreign registration. A trade-mark registration may be renewed upon payment of a fee and petition filed within six months prior to the expiration of the period for which a certificate was issued.

It is hardly to be expected that the bill will pass the Senate in its present form. Section 5 will need revision to meet the purposes for which it was drawn. It was intended in the last paragraph of that section to provide for the registration of marks which might not be technical trade marks, but which have acquired a certain vogue or recognition by use of ten years or more, and which have been in actual use as distinguished from "lawful" use.

Section 13 provides that any person who is injured by the registration of a trade mark may apply to have that mark canceled. The use of the word "injured" is not very clear, and may indicate more than may have been intended. It was probably intended to mean that any person may apply for cancelation of registration if he can show that a registered trade mark simulates one used by him and to which he has a prior right.

It is to be hoped that with the proper clerical corrections, the bill will pass the Senate.

ECLIPSE EXPEDITION FROM KIRKWOOD OBSERVATORY, BLOOMINGTON, IND.

The expedition is under the direction of Prof. John A. Miller, Professor of Mechanics and Astronomy, assisted by W. A. Cogshell, Assistant Professor of Astronomy; A. F. Kuersteiner, Professor of Romance Languages, who is now in Spain; and J. E. Valdez, a young Spaniard, who is a student at the university. These gentlemen are all members of Indiana University. The university has assumed financial responsibility for the expedition, but it has been aided by generous contributions from the Indianapolis News and the Reader Magazine, published at Indianapolis.

The equipment will consist of (1) A photographic telescope of 8 inches aperture and about 70 feet focal length. It will be mounted horizontally and fed by a cœlostat, the mirror of which is 14 inches in diameter. Five exposures will be made with this telescope. The negatives thus obtained, it is hoped, will give some information regarding the structure of the inner corona. (2) Four other cameras, varying in focal length from 80 to 60 inches, will be mounted on a polar axis. (3) There will be a battery of four cameras of 3½ inches aperture and 11 feet focal length, with which photographs will be made in search of the intra-mercurial planets. Pictures of the region where the sun will be at that time will be made at the Kirkwood Observatory, in order to compare them with the photographs made at the time of the eclipse. The expedition will go to Spain, but the exact location has not yet been definitely decided.

SCIENCE NOTES.

Frédéric Mistral, the Provençal poet recently awarded $10,000 as half share of the Nobel prize for literature, intends to devote this sum to the development and adequate installation of the ethnographical museum—Le Musée Arletan—founded by him some years ago at Arles. For this purpose the municipal authorities agree to make over an old palace, now used as a college, the restoration and adaptation of which will cost $50,000. An American resident at Avignon, Mr. Edward Leon, has offered $10,000 as a subscription, and will arrange for five lectures in the United States to help on the fund thus inaugurated.

The prizes for the year 1904 have been awarded, we learn from La Nature, by the Paris Society for the Encouragement of National Industry. The grand prix of the Marquis d'Argenteuil has been awarded to MM. Auguste and Louis Lumière for their discoveries in photography. The "chemical arts" gold medal has been awarded to M. Héroult for his works on electrometallurgy, and the "constructions and fine arts" medal to M. Arnodin. Gold medals have also been awarded to M. Boulanger for his micrographic work, to M. Grey for a rolling-mill, to M. Guillet for his work in metallurgy, and to M. Schwoerer for his system of superheated steam.

To those connoisseurs who evince great pride in their collections of Dresden china, it will come as a great shock to learn that to-day there is no such product under this name, although sold as such. In the course of a prosecution in London, where a firm was prosecuted for selling ware as Dresden and marking the goods as such, it was stated that no china is manufactured at Dresden. The name is applied to the products of the royal factory at Meissen. Furthermore, many pottery decorators at Dresden work upon china that is manufactured at different places, is transferred to that city, receives its imprint, and is then disposed of as Dresden china.

At a recent meeting in London of the British Ornithologists' Club were shown the legs of three lapwings, demonstrating the extraordinary injuries that are inflicted by the accidental entanglement of sheeps' wool around the feet of the birds. In one instance so tightly had the wool encircled the bird's foot, that one of the toes had mortified and had dropped off, while in another case the bird had lost all its toes from this cause. The birds become entangled with the wool while flying among bushes and shrubs upon the animal's grazing ground, and also when they settle upon the sheeps' backs, and their beaks are not sufficiently strong or long enough to remove the strands from their feet.

An interesting archeological discovery was made in the neighborhood of Bournemouth, England, recently. During the construction of a new road the excavators cut into a mound, which is indicated upon the maps as an ancient burial ground, and a large sun-baked clay urn was unearthed. It was in a remarkable state of preservation, and was intact, though in removing it the vessel was slightly damaged. The urn was only buried a few inches below the surface of the ground; in fact, the roots of the heather had forced their way into the interior of the receptacle into the ashes and dust it contained. Upon examination by experts, the urn was estimated to be two thousand years old. As this road will penetrate through other similar mounds, the work is to be conducted under the supervision of antiquarians, in the hope that other articles of archæological value may be excavated.

According to Nature, an optical convention will be held, under the presidency of Dr. R. T. Glazebrook, F. R. S., at a date toward the end of May next, at the Northampton Institute, Clerkenwell, London, E. C. The object of the convention is to bring into co-operation men interested in optical matters. A sub-committee has been appointed to consider the subjects of papers on optical questions, which should be brought before the convention, and suggestions as to subjects for discussion will be welcomed. It has been decided to organize an exhibition, of a scientific character, of instruments manufactured in this country, with a view to show the progress recently made and to stimulate further efforts. In order that interest in the convention may not be confined to London workers in optics, a sub-committee is being formed to secure the assistance of local representatives. The honorary secretary of the convention is Mr. F. J. Selby, Elm Lodge, Teddington.

A NOVEL TYPE OF HAY STACKER.

BY DR. ALFRED GRADENWITZ.

A novel type of hay stacker has recently made its appearance in Germany. The stacker renders it possible to unload and stow away a cartload of hay in eight minutes and with the aid of only three men.

In constructing the stacker, special regard was paid to portability. The device consists of a light, yet substantial iron construction having a rotary support fitted with a hoist and a boom for picking up the load. A grip or a straw tongs is used. The rotary support consists of two U-iron frames fitted with a pivot, at top and bottom, and telescoping one into the other. The total length of the rotary support, that is the distance apart of the pivots, is altered at will, the adjustment being effected by means of bolts.

The free end of the boom is suspended from a chain running over two rollers, one being fitted in the upper and the other in the lower frame; the chain is fixed by its upper end. In case the position of the boom is such that the stress of the chain due to the load is insufficient to avoid a deflection of the rotary support, the chain is fixed at the upper roller by means of a pin, and its tension regulated by a special device.

The rope running over the roller fixed to the end of the boom is wound up by means of a winch, with the usual dog and gear, to enable even heavy loads to be readily lifted by a single man. In order to lower the load rapidly, the driving wheel of the winch is thrown out of gear axially, the speed being controlled by a hand brake.

The two pivots of the crane turn in bearings fixed to the timber above and below. As soon as a space corresponding with the double loading range of the crane has been filled with hay, the crane is shifted to the next loading center, arranged at the double distance of the projection of the crane, and so on, a pair of pivot bearings being arranged for each loading center.

The discharging is effected as follows: A man standing on the hay or corn throws the open tongs or fork, which holds a quarter or a third of a cartload, to a great depth into the load. The man handling the crane winds up the rope and swings the crane over the place where the charge is to be stowed. The man on the stack at the same time, by drawing the disengaging tow, causes the catch to be opened, which was closed by its own weight and the weight of its load. The load as it drops out is distributed. After the crane has swung back, the operation is renewed.

A SEEDLESS, CORELESS, BLOOMLESS APPLE.

A SEEDLESS, CORELESS, BLOOMLESS APPLE.

BY A. FREDERICK COLLINS.

Everyone is familiar with the seedless or navel orange, but the seedless apple is a new fruit on the market.

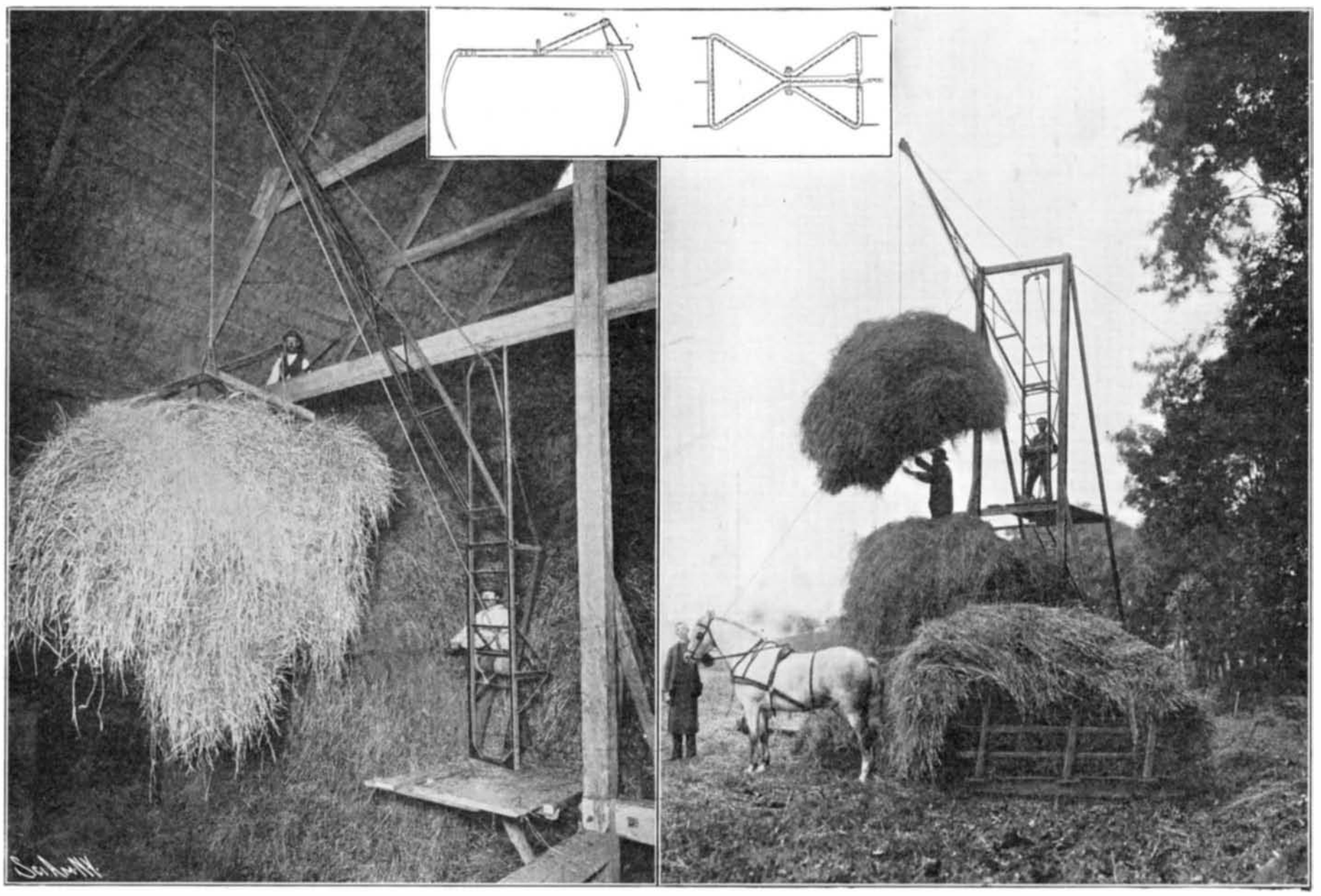
This marvelous improvement in the common apple, fulfilling in letter as well as in spirit the jest of the schoolboy, who proclaimed that "there ain't going to be no core," would seem to indicate that the new apple will eventually monopolize the markets of the world, for reasons which the appended data clearly point out.

By way of illustration, it may be said that the seedless and coreless apple follows closely the analogue presented by the seedless orange, and is in fact a prototype of the latter. When the seedless orange was introduced to the public, it was regarded in the light of a horticultural wonder, for if there were no seeds, by what uncanny method was their kind propagated.

Shrouded in a mystery such as this, it required some little time for the matter-of-fact virtues to impress themselves and the real merits of the fruit to become known; but once eaten, its subtle qualities were forgotten, and its advantages were quickly appreciated, and from that day to this the old-fashioned variety, with its multiplicity of seeds, has suffered severely, having been almost driven from the market, and left all but out of the race. Now let us ascertain the real difference between the two varieties of the oranges, as the comparison will serve a useful purpose when the old and the new species of apples are being similarly considered. The reason seedless oranges are universally preferred to those that contain ovules is not because any saving is effected, but simply that the seeds are in the way. The ordinary apple presents a wholly different aspect, for the seeds are inclosed in hard pockets that represent at least one-fourth of the apple, and which cannot be utilized in any way as an article of food, whereas in the seedless variety these disagreeable features are entirely eliminated. Still, what is more to the point of economy, apples without seeds are also wormless, for it is well known to growers that worms in apples obtain their sustenance not from the meat, but from the seeds; hence it is evident that if a worm was hatched in a seedless apple, it could not live.

The beginning of the seedless apple dates back only a few years, and therefore its history is necessarily

(*Continued on page* 102.)



The Hay Stacker Set Up in a Barn. Fork-Releasing Mechanism. The Hay Stacker in the Field.

A NEW HAY STACKER.

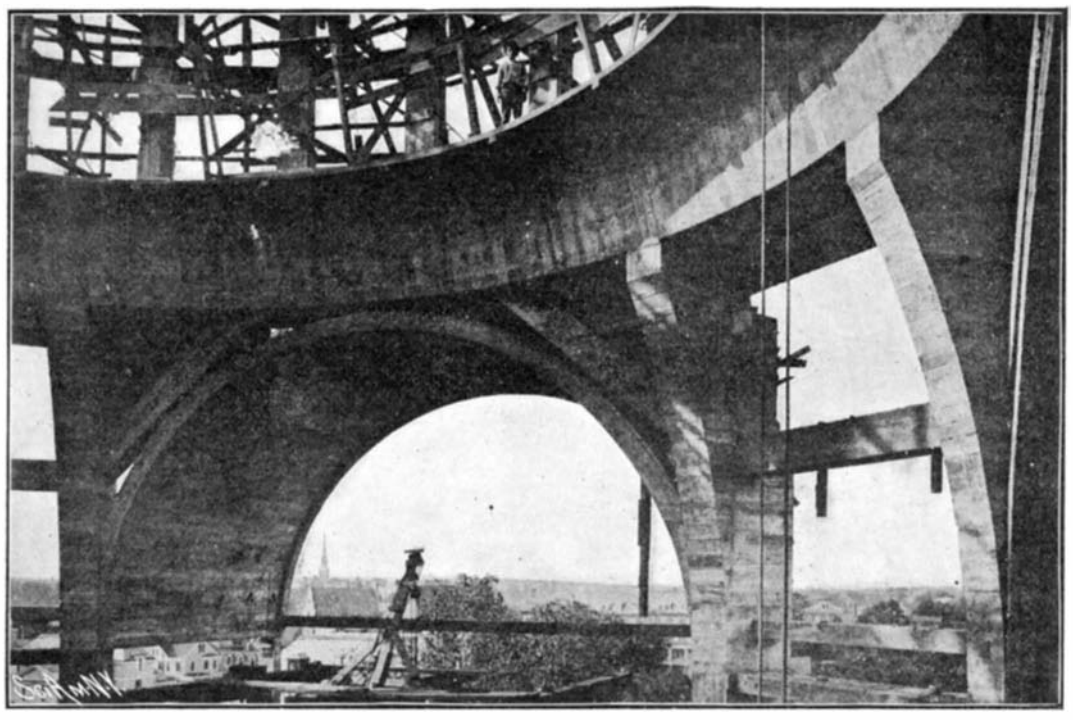
THE NEW CONCRETE CHAPEL OF THE UNITED STATES NAVAL ACADEMY, ANNAPOLIS.

BY DAY ALLEN WILLEY.

One of the most notable of the group of buildings which has been designed for the new Naval Academy at Annapolis is the chapel. Although all of the structures are of impressive size and architecture, the great height of the chapel and its other dimensions will make it one of the most imposing religious edifices in the United States when it is completed. From the ground to the top of the "lantern," which is to surmount it, the distance is 210 feet, while the extreme width of the structure is 130 feet. The building, whose plan is in the form of a Greek cross, measures 83 feet in diameter beneath the dome, not counting the transepts, which when added give a total interior width of nearly 117 feet.

The appropriation of $400,000 for the chapel gave the architect an opportunity to design not only a spacious, but a very ornate edifice. Realizing the effect of a large dome, one was planned which extends to a height of nearly 150 feet above the roof of the main building, with a diameter of 69 feet at its base. The base of the dome is 13 feet smaller than the circle formed by the center of the main building, consequently the construction of the chapel has been attended by some unusually interesting engineering features. If the great weight of the superstructure had been supported by the exterior walls, it would have been necessary to make these of extraordinary thickness or to utilize columns in the interior, which was not considered desirable. As a substitute for interior columns and what might be termed wall support, a somewhat novel method of carrying the load of the dome has been adopted. In it the material known as ferro-concrete has been utilized in a framework, which relieves the exterior walls of practically all stress except that due to their own weight and that of the dome.

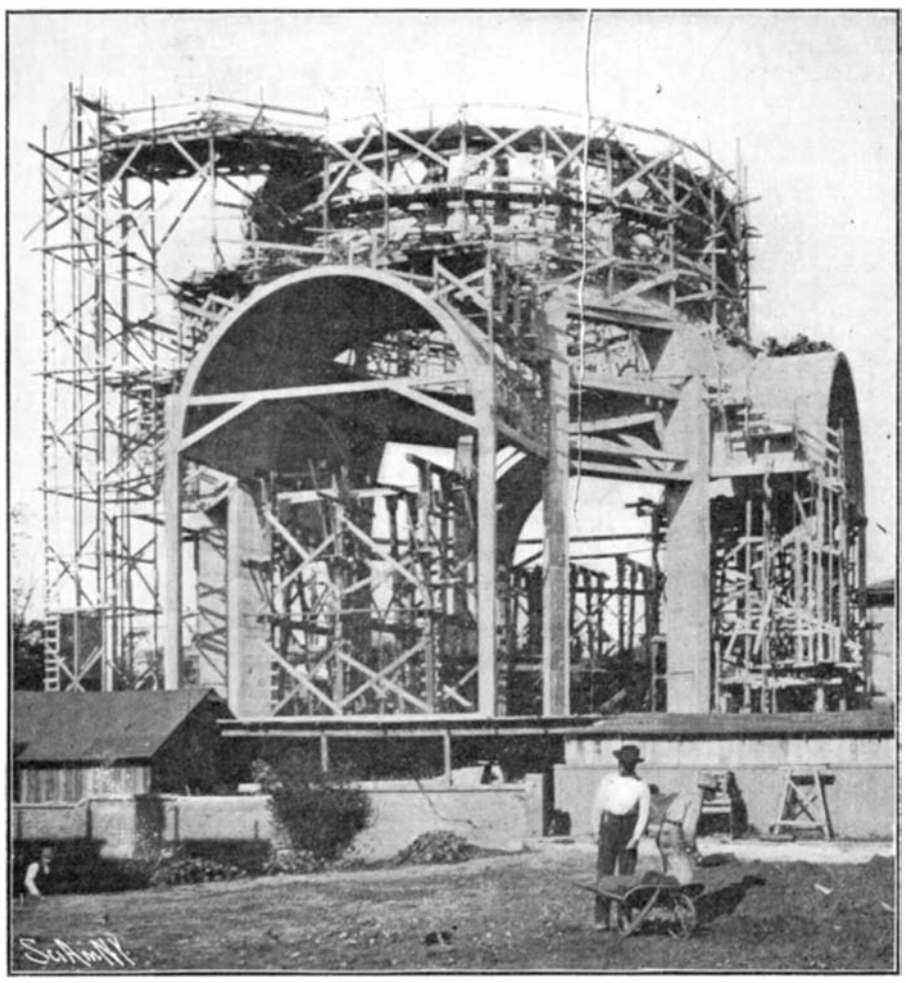
In the space allotted for the exterior walls have been constructed eight concrete pillars, placed at such distances apart that each sustains a load of about the same weight. They are of equal height as well as size, and at the top are set into an enormous ring of the same material, which is really the main foundation for the dome. The dome itself rests upon twenty-four smaller columns of concrete, which are also set in a smaller ring of this material. As already stated, the extreme top of the building consists of a "lantern" of terra cotta, which in itself is about 50 feet high, and represents a weight of no less than 140 tons. It was considered too heavy to be supported merely by the roof and framework, so provision has been made to sustain it independently of the roof by means of another skeleton of ferro-concrete, which assumes the form of a pyramid, the top of the pyramid being directly beneath the center of the "lantern" and upholding it.



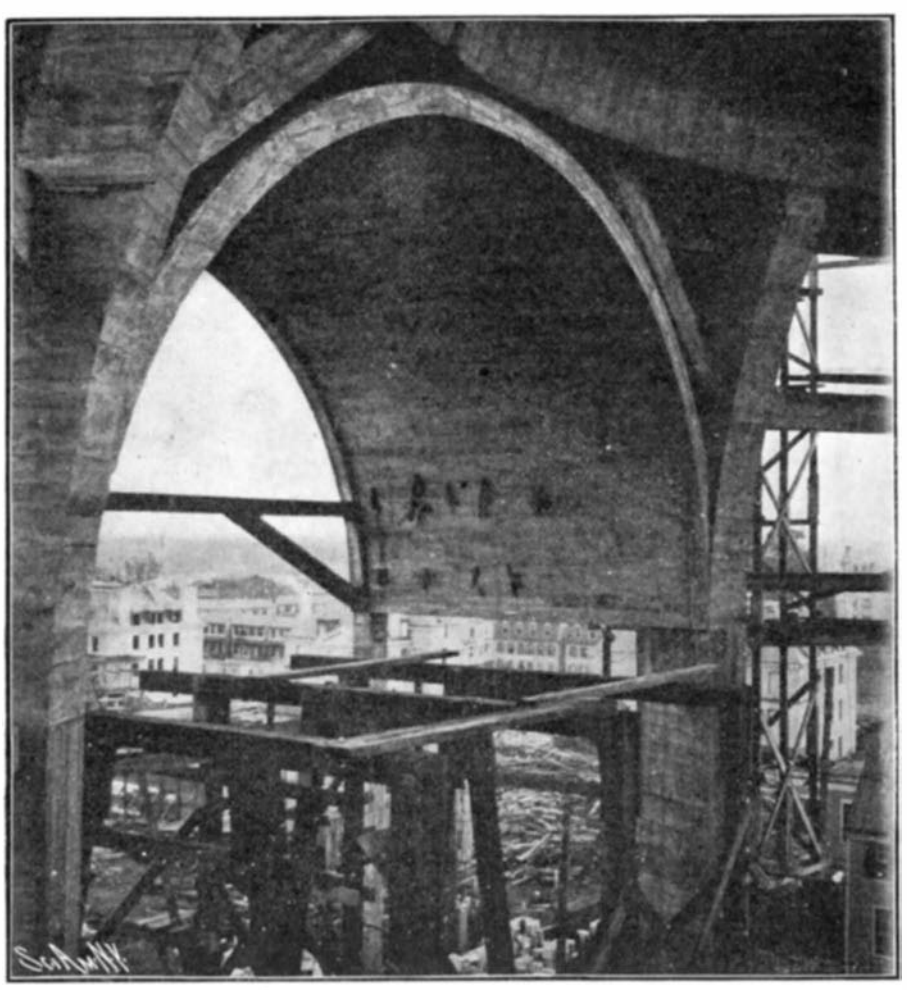
View Showing Transept, Piers, and Foundation Ring of the Dome Tower.

While the problem of constructing pillars of suitable dimensions to sustain the superstructure was in itself difficult to solve, it was necessary to curve the pillars to a considerable extent, in order to set them at the proper angles in the lower ring. For a distance of 55 feet above the ground they are perpendicular, the remainder of the length, 21 feet, forming the curve, which allows the exterior of the chapel to be fashioned in an exceedingly graceful outline. An idea of the massiveness of the columns can be gained when it is stated that each is 2½ feet by 6 feet in section. Through the center extend steel rods, which reinforce the strength of the concrete and give it the necessary resistance to bending. The lower ring, in which the columns terminate, is one of the heaviest portions of the building, but as already stated, it has been molded in a solid piece. The total weight which these columns will sustain when the chapel is completed is over 3,000 tons, each being constructed to carry a load of 383½ tons. Excluding the lower ring, the weight represented by the cupola and the "lantern" above is nearly 1,400 tons. In the main structure the exterior of the arches forming the transepts is also supported by columns of concrete which are 2 feet by 1 foot in dimensions. This formation separates the center of the edifice from the transepts, making of it a huge tower, and practically an independent structure; but as already stated, the exterior walls, except the portion represented by the columns, will sustain merely their own weight, and consequently they can be built much more lightly than if they were essential for support. The outside of the walls will be principally white glazed brick on a foundation of granite, which will give the building a very appropriate as well as a very artistic appearance. Inside, Caen stone will be utilized. The exterior wall will be 18 inches in thickness, with a second wall 12 inches in thickness, separated from it by a space of 12 inches. The concrete columns supporting the center as well as the transepts will be completely hidden from view. The smaller columns in the dome will be covered with ornamental terra cotta to match the treatment of the "lantern." As the various illustrations indicate, the timber work or false work required to furnish the concrete skeleton was very extensive. The dimensions of the wooden mold for the larger ring can be realized in studying the interior of the building. The framework necessitated the exercise of much skill on the part of the designers, representing as it did the exact shape of the skeleton on an enlarged scale. The manner of molding the concrete into shape was the same as is usually employed in what is known as ferro-concrete construction. After a mold was completed, the metal rods were inserted in it in the proper position, then the composition was poured into the mold and left to solidify. The chapel represents the most elaborate form of framework of this kind which has yet been attempted in the United States. The plan followed originated with the French engineers, who were called into consultation, and the work was done under their supervision.

An interesting feature connected with the design of the chapel is that beneath the main floor has been



General View of the Chapel, Showing the Elaborate Scaffolding Necessary to Support the Forms in Which the Concrete was Molded.



Near View of One of the Transept Arches, Showing Junction of Curved Top of Columns with Foundation Ring that Carries the Tower.

The total height of the finished building is 210 feet. The width across the transepts is 180 feet. The diameter of the dome is 69 feet. The total weight of the tower and dome is 3,000 tons.

CONCRETE CONSTRUCTION OF THE NEW CHAPEL, NAVAL ACADEMY, ANNAPOLIS.

provided a large crypt, which will be utilized for the tombs of naval officers, whom it is desired to inter at this historic place. In fact, this feature of the chapel may be compared with that provided at Westminster Abbey in London. The crypt floor will be 12 feet below the main floor, and will be entered both from the interior and the exterior.

A SEEDLESS AND CORELESS APPLE.

(*Continued from page* 100.)

brief. All the credit for the propagation of the apple thus far belongs to Mr. John F. Spencer, of Grand Junction, Col., who, struck with the success of the seedless orange, believed that similar results could be obtained with apples.

After several years' experimental research he succeeded in producing five trees that bore seedless, coreless, and wormless apples, and from this little group there has budded two thousand more trees, which at present constitute the entire seedless apple stock of the world; and from these two thousand trees all the rest of the world must be supplied. It is estimated that these will have produced about three hundred and seventy-five thousand nursery trees by the fall of 1905, and that the following year at least two million five hundred thousand trees will furnish the supply.

There are many striking peculiarities in the development of the seedless tree, as well as in the fruit. As an instance, it may be cited that the tree is blossomless; and while there is a stamen and a very small quantity of pollen, exactly as in the blossom of the ordinary apple tree, yet the blossom or flower itself is missing. The photograph shows the only bloom, flower, or blossom that ever appears on the seedless apple tree.

The only thing that resembles a blossom comes in the form of several small green leaves that grow around the little apple to shelter it. It is this lack of blossom that makes it almost impossible for the codling moth to deposit its eggs, and this practically insures a wormless apple. As it is the blossom of the common apple tree that is attacked by cold and frost, the seedless apple tree is immune, and the late frosts that play havoc with the apple grower's purse by denuding his orchard may now become a thing of the past, and at the same time prevent worry and increase profits.

The seedless apple tree has a hard, smooth bark, and may be grown in any climate; the meat of the new apple, like that of the seedless orange, is very solid, and in both there is a slightly hardened substance at the navel end. Through long development this has almost disappeared in the orange; and while it is more or less prominent in the seedless apple, it has been materially reduced on the last generation of trees, and all sizes tend to show that it will grow smaller with successive generations, as the navel end of the orange has grown smaller.

The apples, which are of a beautiful dark-red color with yellow strawberry dots, are of a goodly size and have a flavor similar to the Wine Sap.

The Current Supplement.

"The Coal and Ore Handling Plant in the Island of Elba" is the title of an article that opens the current SUPPLEMENT, No. 1518. Illustrations, both photographic and diagrammatic, accompany the text. A brief but instructive account of the Wachusett reservoir and dam is published. Mr. Charles H. Stevenson describes general methods of preparing aquatic leathers. Peter Eyermann, one of the staff who had charge of Machinery Hall and allied exhibits at the World's Fair, has designed a locomotive and a steamship which are to be driven by producer-gas. These designs are published in the current SUPPLEMENT with a full description. A. Frederick Collins writes on the De Forest-Ives electric wave-length standard. Ancient and modern methods of measuring time was the subject of the Christmas lectures at the Royal Institution. An abstract of these lectures is published. Edmund Otis Hovey writes on the Seventeenth Annual Meeting of the Geological Society of America. The Bureau of Census has just published a bulletin showing the conditions of irrigation in the United States in 1902. This bulletin is reviewed. An elaborate article on the Transmission of Yellow Fever by Mosquitoes is published. We print the last installment describing the Paris Automobile Show.

A new form of incandescent lamp in which vaporized petroleum spirit is used has been devised. The principle of the invention is a petroleum spirit vessel placed at a higher level than the burner. From this vessel the gasoline gravitates through a tube to a control valve, which regulates the flow of the volatile liquid into a generator, where it is vaporized through being heated by a separate flame. The gas then passes through a needle valve, receives its correct proportion of air, and is then ignited in a burner fitted with an ordinary incandescent mantle. An intense light is produced. To start the lamp, the vaporizer has to be heated, and this is accomplished by the ignition of a little methylated spirit poured over asbestos contained in a tray placed below the needle valve. The petroleum consumption of the lamp with the maximum light is very economical, one quart of spirit being sufficient to give a light of 150 candle power for sixteen hours. Though the inherent dangers attending the use of petroleum are by no means obviated in this device, it constitutes an excellent lamp for outdoor use.

New Radium Theories.

Two announcements, one by Prof. Monroe Snyder, the other by Prof. E. Rutherford, of McGill University, Montreal, Canada, have recently been made, which are of so startling a nature that, had they come from less trustworthy sources, they would have been immediately discredited.

Prof. Snyder, in a preliminary paper read before the American Philosophical Society, discoursed on his discovery of radium in the photosphere of the sun. Prof. Snyder finds in radium the cause of the heat and luminosity of the celestial bodies. In his opinion, variable stars are caused, not by the revolution of one body about another, but by the regular fluctuation of light, which is due to periodical outbursts of radioactivity. The professor concludes that the sun is a variable star with a period of eleven years, and that the sun spots are one of the demonstrations or results of these outbursts of radium emanations. The problematical rings of light so characteristic of many of the nebulæ are accounted for by Prof. Snyder by treating them as transition stages of radioactivity.

Prof. Rutherford holds that the radioactive substances are the cause of the earth's heat. His theory is promulgated in a recent number of Harper's Magazine. In that periodical, after reviewing Kelvin's mathematical deduction of the earth's age, he formulates his theory. The following are abstracts from his article:

"While the heat supplied by possible chemical combination is quite inadequate to account for the heat of the sun and earth, the recent discovery that the radioactive bodies are able to emit an amount of heat about one million times greater than is evolved in the most violent chemical reaction, throws quite another light on the question. In the course of a year, one pound of radium would emit as much heat as that obtained from the combustion of one hundred pounds of the best coal, but at the end of that time the radium would apparently be unchanged and would itself give out heat at the old rate. It can be calculated with some confidence that, although the actual amount of heat per year to be derived from the radium must slowly decrease with the time, on an average it would emit heat at the above rate for about one thousand years.

"But a still more remarkable fact remains to be noticed. Dr. Barnes and the writer showed that more than three-quarters of the heating effect of radium was due to the radioactive emanation stored in it.

"Sir William Ramsay and Mr. Soddy have recently found that the volume of the radium emanation stored in one gramme of radium is about one cubic millimeter at atmospheric pressure and temperature. The emanation is known to be a heavy gas, and, taking its molecular weight to be one hundred times that of hydrogen, it can be readily calculated that if one pound weight of the emanation could be collected, it would initially radiate energy at the rate of about 8,000 horse-power. This output of energy in the form of heat would fall off with the time, but the total amount of energy liberated during its life corresponds to that required to drive an engine of 10,000 horse-power for five days.

"Since there is little doubt that a quantity of radium, left to itself, would in the course of time completely change into the emanation and other products, we see that at least an equal quantity of energy must be given out by radium during its transformation. According to present views, the emission of heat is a consequence of a breaking up of the radium atom into a succession of radioactive products. The disintegration is explosive in character, and is accompanied by the projection of a flight of material particles with great velocity.

"Since all the radioactive bodies emit particles, each of them probably emits heat at a rate proportional to its radioactivity. The heating effect of uranium is probably only about one-millionth part of that shown by an equal weight of radium.

"Although the radioactive substances are found in the greatest quantity in pitchblende, radioactive matter has been found to be distributed to a minute extent throughout the atmosphere and the earth's crust. Much of our information in this important field has been due to the splendid work of Profs. Elster and Geitel, teachers in the High School of Wolfenbüttel, Germany.

"The emanations of radium and of other radioactive substances are present everywhere in the atmosphere. Every falling rain-drop and snowflake carries some of this radioactive matter to the earth, while every leaf and blade of grass is covered with an invisible film of radioactive material.

"These emanations are not produced in the air itself, but are exhaled from the earth's crust, which is impregnated with radioactive matter. The air in confined spaces like caves and cells is, in most cases, very radioactive on account of the presence of emanations which have diffused from the soil. The radium emanation has been found in the water from deep wells and springs, in surface and lake water, in escaping natural carbonic acid, and in the oil from wells. Elster and Geitel have shown that the soil itself is radioactive to varying degrees, the activity being most marked in clayey deposits.

"Since the radioactive substances present on the earth are continuously expelling α particles, heat must be evolved in amount proportional to the quantity of active matter present and to the intensity of its radiations. The question then arises, is the amount of radioactive matter present in the earth sufficient to heat it to an appreciable extent? I think that, even with our present knowledge, this question must be answered in the affirmative.

"Taking the value of the conductivity of rock used by Lord Kelvin, and knowing the average temperature gradient, the amount of internal heat lost per second from the earth by conduction to its surface can readily be calculated. Since one gramme of radium emits enough heat each hour to raise one hundred grammes of water through 1 deg. C., a simple calculation shows that the present loss of heat from the earth is equivalent to that supplied by the presence of about two hundred and seventy million tons of radium. This amount may seem very large compared with the small quantities of radium hitherto separated, but is small, for example, compared with the annual output of coal from the world. It can readily be deduced that this amount of radium, if distributed uniformly throughout the earth's crust, corresponds to only five parts in one hundred million million per unit mass. This is a very small quantity, and calculations based on the observations of Elster and Geitel show that the radioactivity observed in soils corresponds to the presence of about this proportion of radium. In some soils it is greater, in others less, and in this calculation no account has been taken of the deposits of uranium and thorium materials. A large amount of observations of the materials of the earth for radioactivity will be required before such a conclusion can be considered to be established, but the magnitude of the radioactivity observed is certainly suggestive.

"In this calculation it is not assumed that the radioactivity of the soil is due to radium alone. Other kinds of radioactive matter are undoubtedly present, but, for simplicity, the results are expressed in terms of that amount of radium in the soil required to exhibit the observed radioactivity.

"If radioactive matter is distributed throughout the whole earth to the extent that experiment indicates, the heat evolved by the radioactive matter would compensate for the heat lost by the earth by conduction to the surface. According to this view, the present internal heat of the earth tends to be maintained by the constant evolution of heat by the radioactive matter contained in it. The calculations of the age of the earth made by Lord Kelvin, which were based on the theory that the earth was a simple cooling body in which there was no further generation of heat, cannot apply, for the present temperature gradient of the earth may have been nearly the same for a long interval of time."

Automatic Fire Alarm to be Operated Over Telephone Wires.

Patents have been recently granted to W. L. Denio, of Rochester, N. Y., on a telephone fire alarm system.

This device secures its energy from the central office, so that there is no local battery to get out of order. It consists of one or more signal boxes installed in any building having a telephone. One signal box is sufficient for ordinary purposes, but if one box is placed on each floor, a fire starting on that floor would send a signal through that box, which would indicate that particular floor, so that no time would be lost by the fire department in locating the exact seat of the conflagration.

Leading from the signal box is a circuit on which glass-protected push buttons are located at convenient points, also thermostats on the ceiling. This signal box consists essentially of an electro-magnet arranged to be energized by the closing of the circuit by a thermostat or push button, which magnet unlocks a vibrating pendulum driven by an escapement wheel and a spring, actuating a revolving star-pointed contact wheel, operating to send in the signal indicating the floor on which the fire occurs. For instance, the wheel in the signal box on the fourth floor would be four points, one on the fifth floor five points, and so on.

The signal box is so constructed that the signal will be repeated a sufficient number of times to insure the central exchange operator's getting it correct. The star-

pointed wheel causes the central exchange light to flicker, and it cannot be mistaken for anything else, because the operator is able to hear the mechanism of the box. The sound is very positive and distinct, and cannot be misunderstood.

Provision is made for breaking the circuit through the alarm apparatus, after the alarm has been sent in, so that there is no interference with the use of the telephone. The thermostats are so constructed that the moment they are subjected to 125 deg. of heat they collapse and close the circuit, thus sending in the signal.

It makes no difference whether the telephone line happens to be busy or the receiver has been carelessly left off the hook, the alarm takes precedence, automatically cutting out everything else until it has gone in and automatically placing the telephone in use again. When the operator at the central exchange receives a signal, she notifies a special operator in charge of the fire calls, who in turn sends the alarm to fire headquarters, being able from her list of subscribers to tell the exact location of the fire. In the meantime the first operator rings the 'phone bell in the office or building from which the alarm came, thus notifying the person who had sent the alarm that it had been received and the fire department is on the way; or in the event of an alarm's having come from a distant part of the building, a man sitting in his office might be thus warned by the telephone operator that there was a fire in his building, which he had not discovered.

Mr. Denio's patented thermostat and push button circuit is such that it could almost entirely be destroyed and still the alarm will go in just the same.

THE TURRET AND BARBETTE OF A BATTLESHIP.

If called upon to name the most important element in a battleship, we would unhesitatingly name the battery, and, more specifically, the 12-inch gun. If this estimate be correct, particular interest attaches to the means of mounting, protecting, and operating the 12-inch gun; and we think that the drawing on the front page of the present issue will be found to answer very fully any questions that may be asked upon this subject. The illustration is a vertical, sectional view, carried down through the structure of the ship, in the plane of the keel. It includes enough of the ship, in the fore-and-aft direction, to take in the ammunition and handling rooms, and to show the methods of storing the shot, shell, and powder, far down below the waterline, and the means by which it is brought up from its safe retreat until it is level with the breech of the gun.

Commencing then at the bottom of the section, we have, first, the outside skin or plating of the ship; then about four feet above that the inside plating, or inner bottom, as it is called. These outer and inner shells extend across the full width of the bottom of the ship and up the sides of it, until they reach a point about 5 feet below the waterline, where the inner shell terminates, the outer shell being continued up to the upper deck, some 20 feet above the waterline. At the point where the inner shell terminates there is formed an offset or ledge, known as the armor shelf, upon which the heavy waterline armor, a foot or so in thickness, finds a footing. The space between the outer and inner bottoms is divided longitudinally by the frames of the ship, which extend across the bottom and up the sides to the main deck; and this double bottom is further subdivided by a series of longitudinal girders, which extend parallel with the keel throughout the length of the ship, and thus serve to divide the space into a large number of separate cells, the whole system thus divided being known as the cellular bottom. Upon the inner bottom, or floor of the ship, in that portion shown in our drawing, and between that and the first deck above, is a magazine in which is stored the ammunition, or part of it rather, for the rapid-fire guns of 6-inch caliber, which are mounted upon the gun deck and main deck. The ammunition is stacked neatly in racks, arranged as shown in our illustration. At the after end of the magazine is seen the foot of an electrically-operated ammunition hoist, which consists practically of an endless chain belt, provided with racks in which the ammunition is placed and carried to the guns. On the deck above this ammunition room, and arranged centrally below the barbette, is located the handling room, into which open, by water-tight doors, the magazines that contain the powder charges and projectiles for the 12-inch guns. The powder, done up in bags, and the projectiles, are picked up from the rack by an overhead trolley, run out into the handling room, and lowered into the cages of the ammunition hoist. Two decks higher up we come to the steel protective deck, which is from 2½ to 3 inches in thickness, and extends from side to side, and throughout the whole length of the ship at the level of the waterline. This deck serves to prevent the passage of fragments of bursting shell down to the magazines, engines, boilers, steering gear, and other vital elements of the ship.

Upon the protective deck is erected a great cylindrical structure, known as the barbette, whose walls, 8 to 12 inches in thickness, consist of solid plates of face-hardened Krupp steel. This barbette is practically a circular steel fort; and it is thick enough, and the steel walls are hard enough, to break up and keep out the heaviest projectiles of the enemy, except when they are fired at close ranges. At about two-thirds of the height of the barbette is a heavy, circular track upon which runs a massive turntable. The framing of this turntable extends to a level slightly higher than the top edge of the barbette, and upon it is carried the massive structure of the rotating turret, which is formed, like the barbette, of thick steel armor, bolted to suitable plate steel framing. In plan the turret is elliptical. Its front face, which slopes at an angle of 40 degrees, is pierced with two ports, through which project two 12-inch guns. The mounting of these guns is carried also upon the turntable, and revolves with the turret.

From the breech of the two guns a steel runway, or elevator track, extends down through the barbette to the floor of the handling room below, where its footing turns upon a step bearing located in the vertical axis of the barbette. This elevator revolves with the turret, and consequently ammunition can be carried up to the guns, no matter in what direction they are trained, whether ahead or on either beam. When the ammunition car in the handling room has been loaded an electric motor runs the car up to the breech of the gun, where the projectile and the charge are pushed from the car into the gun by means of an electrically-operated rammer, which will be noticed in our engraving at the rear of the turret, with one of the gun detachment operating the controller. All the movements connected with the loading and elevating of the gun, and the traversing of the turret, are performed by means of electric motors, and in our latest ships the various operations are under such perfect control that a 12-inch gun may be laid with as much ease and accuracy as a 6-inch rapid-firer. The circular projection seen at the forward part of the turret upon the roof is the sighting hood, from which the officer in command of the turret controls the sighting of the guns.

To Get More Heat From a Radiator.

There are a good many rooms where the radiator is either too small or the steam pressure is too low to maintain a comfortable temperature in severe weather. If the tenant is enjoying the many advantages afforded by central station electric lighting service, the matter can easily be remedied. Take the fan that kept you cool all summer and set it where it can blow against a large part of the radiator's surface. Turn it on at low speed, or at high if necessary, and your cold room will soon be thoroughly warmed. The philosophy of the thing is that steam at a low pressure carries much less latent heat than steam at a high pressure, and therefore warms the radiator so poorly that only a slight draft of air rises around the pipes, and condensation is slow. With the fan in operation there is a forced draft against the radiator that conducts a great deal more heat away from the iron, cooling it so that much more condensation of steam occurs inside it. The heat thus snatched from the reluctant radiator is held in the circulating atmosphere of the room, which is soon changed from cold to warm at a trifling cost for electric energy.—Electric City.

Death of Ernest Kempton Adams.

In the death of Ernest Kempton Adams, the profession of electrical engineering has lost one of its most promising members. Although only a very young man, Mr. Adams had been associated with the development of the stupendous Niagara enterprise. Despite his years, he left behind him no less than two hundred and forty-one inventions in diverse branches of physics. His electrical work embraced the designing of almost every type of electrical machinery, including generators, motors, transformers, measuring instruments, contact devices, and switches. Everyone of these embodied some practical improvement. Clock movements, acoustic instruments, physical apparatus, and even psychological instruments were designed by Mr. Adams, all of them affording evidence of most wonderful ingenuity. In purely physical work Mr. Adams's most noted achievement was an electrical repetition of Foucault's famous pendulum experiments. Akin to this is his atmospheric temperature clock, based on the high expansion coefficient of wood alcohol as a means of continuous operation. Mr. Adams had the reputation of being one of the finest draftsmen in his profession. Indeed, instructors in the Department of Electrical Engineering in Columbia University, the institution at which he took his degree, still point with admiration to some dynamo and motor drawings of his which are considered excellent achievements of their kind. In memory of his work, the Ernest Kempton Adams fund for physical research has been donated to Columbia University, for the purpose of promoting research in physical sciences.

Correspondence.

The New York Harbor Entrance.

To the Editor of the SCIENTIFIC AMERICAN:

In your article of January 7, 1905, on the "New York Harbor Entrance," the following point seems to be overlooked:

At the present time there are across the wide submerged flats between Coney Island and Sandy Hook several channels of moderate depth. The article shows that Rockaway Beach is traveling westward and Sandy Hook northward across this area, thus narrowing the entrance.

As the channels are created and maintained by the tidal flow, may we not look for a single, much deeper and better channel after the above narrowing has taken place? In other words, is not the approaching catastrophe, pointed out by Prof. Haupt, a blessing in disguise, but not wholly unrecognizable?

CASSIUS E. GILLETTE,
Major of Engineers, U. S. A.

San Francisco, Cal., January 21, 1905.

The Black Lily.

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN of October 22, I find a description of a peculiar flower which you call "black lily," found in the Philippines by two teachers.

This flower "has not yet apparently been noticed by scientists," you write. It is, however, very well known by scientists, at least by German and Dutch scientists. In this country (Isle of Sumatra) you can find many of them.

The scientific name is *Amorphophallus campanuformis Blume*. It is not a member of the order Lilaceii, but of the Aroideæ, and no real flower, but a "spadix."

The plant is in all its peculiarities very well known to the Dutch of East India, but you must not forget that we are here some centuries, and you in the Philippines only a few years.

I suppose that a botanist can explain the matter to you, if you tell him that this member of Aroideæ is composed of many flowers together and seems to be only one. D. H. ARENDS, JR., Medical Officer.

Tebing Tinggi Palembang, Sumatra, Dutch East India, December 6, 1904.

What Farmers in the Wheat Belt Need.

To the Editor of the SCIENTIFIC AMERICAN:

There are two things especially needed by the farmers of the wheat belt, of whom I am one.

The first, and by far most important, is an automatic shocker attachment to our reaping machines; the second is a practical traction engine adapted to farm and road work in a country where the soil is loose and friable.

As to the engine first: It should combine greater traction power than the average threshing engine, with minimum weight and water consumption. It should be very simple in construction, and built for hard, rough work. Possibly such an engine is on the market, but I have seen nearly all the standard makes and they do not fill the bill from the standpoint of the farmer seeking an efficient farm and road motor.

The automatic shocker is an urgent necessity. It is the one remaining thing needed to insure our harvests being gathered. "Hobo" labor is costly and inefficient. The waste from poor shocking alone would annually amount on the average farm to the cost of such an appliance. It must, to be efficient, do the following things: (1) Hold, place, and discharge, standing and with heads well knit together, not less than seven or eight bundles. (2) Be absolutely under control of driver as to moment of discharge. (3) Not shell over-ripe grain. (4) Add not more than two-horse draft to the machine. (5) Be simple, strong, easily adjusted, and able to handle bundles made from lodged grain. (6) Able to increase or decrease bundles in shock according to size, and general condition.

In my opinion such a shocker can be better adjusted to the header than to the binder type of reaping machines. A shock-forming table behind a header would allow of a lateral discharge of the finished shock without materially increasing the width of the machine. That type of machine, 12-foot cut, could be handled by eight horses and one man, and would have a cutting capacity of about thirty acres daily.

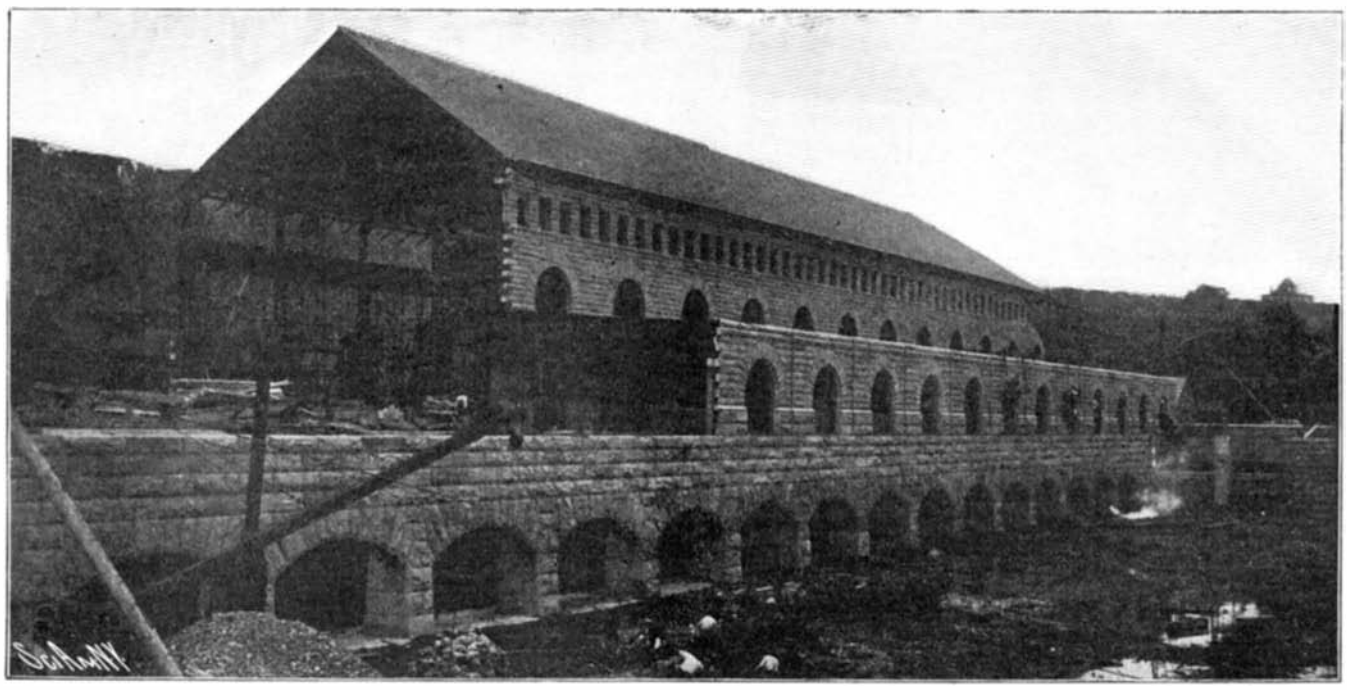
HUGH J. HUGHES.

Hannaford, N. D., December 23, 1904.

The rotary cement kiln was invented by Frederick Ransome, of England, in 1885, but has been perfected and made a commercial success in the United States. In 1893 rotary kilns were used in the manufacture of 25.2 per cent of the Portland cement produced in the United States, and in 1900 this had increased to 81.5 per cent. The cement consumed in the United States during the year 1902, estimating one barrel of cement to one cubic yard of concrete, was sufficient to build a wall 1,000 miles long, 20 feet high, and 7 feet thick.

OPENING OF THE NIAGARA CANADIAN POWER COMPANY'S PLANT.—I.

The Canadian Niagara Power Company is now prepared to deliver electric power for commercial purposes. This company is owned by the Niagara Falls Power Company, which latter company has built two magnificent generating stations on the New York side at Niagara, the combined output capacity of which is 105,000 electrical horse-power. When the plant of the Canadian Niagara Power Company has its complete installation, it will have an output capacity of 110,000 electrical horse-power, or 5,000 horse-power more than is developed in the two big stations at Niagara Falls, N. Y. In the plants of the Niagara Falls Power Company, the unit of development is 5,000 horse-power, whereas in this new plant on the Canadian side of the river, the unit of development is 10,000 horse-power. Thus, where there are 21 units in the two plants of the Niagara Falls Power Company to develop 105,000 horse-power, in this latest Niagara plant there will be but 11 units in the development of 110,000 horse-power.



Power Station Partially Completed, Showing the Forebay, the Arched Entrances Through Which the Water Flows to the Penstocks, and the Main Generating House to Contain Eleven 10,000-Horse-Power Generators.

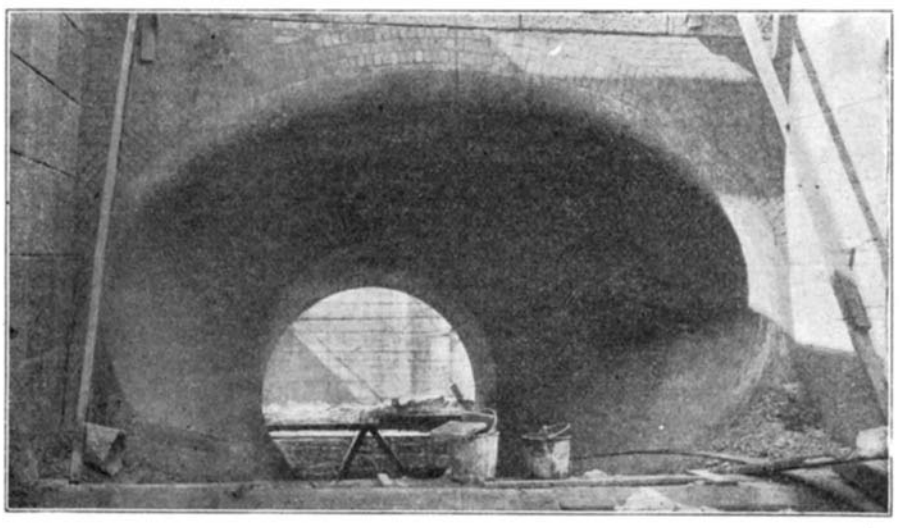
Not only is this Power Company the first at Niagara to adopt a unit of 10,000 horse-power for its hydro-electric plant, but it is the pioneer in the development of Niagara power on the Canadian side for commercial purposes. Less than fifteen years ago, when the International Niagara Commission met in London, England, and adopted a unit of 5,000 horse-power for the then projected development at Niagara Falls, the world marveled, and electrical engineers and scientists awaited with much interest the outcome of the installation. To-day, with the adoption of a 10,000-horse-power unit, it is evident that Niagara is not standing still, but is making rapid strides forward.

The first of the 10,000-horse-power units in the plant of the Canadian Niagara Power Company was started on the morning of Monday, January 2, at which time, in the presence of a party of eminent guests, President William H. Beatty turned the small hand-wheel that released the flood of water in the penstock and allowed it to rush into the turbine, which was soon making 250 revolutions per minute. When Unit No. 1 was in motion, Unit No. 2 was successfully started, and the new power station had 20,000 electrical horse-power at its command. Three additional units of the same capacity are being installed, and these are to be ready for operation by May 1 next, when the Canadian Niagara Power Company will have 50,000 horse-power for use, supply, and transmission. The six remaining units to be installed to bring the power house up to its full capacity will be placed in position very rapidly as demand makes it necessary.

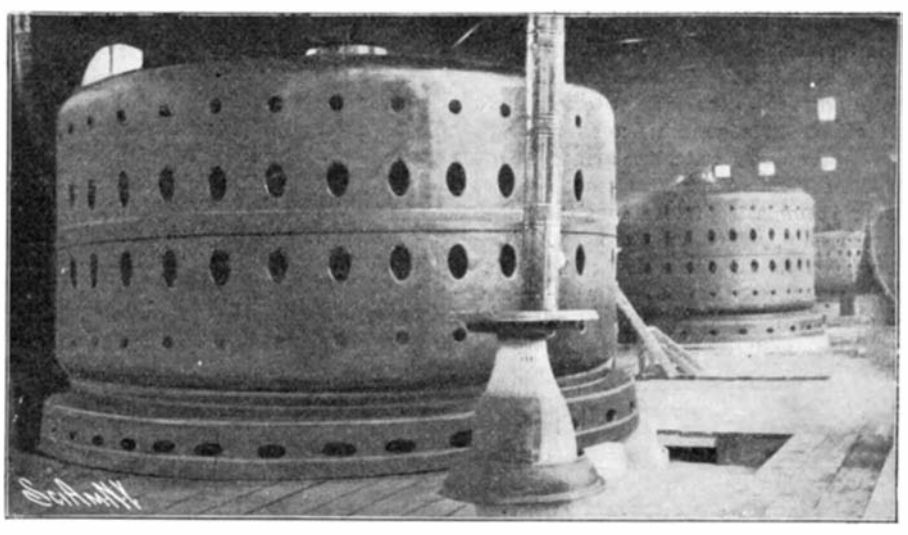
In starting its initial units at this time, the Canadian Niagara Power Company lives up to the terms of its contract with the government. In this contract it is provided that the company shall have a development by January 1, 1905, involving the construction of a tunnel with a capacity for the discharge of water sufficient to produce 100,000 horse-power, a canal or intake from the river with a capacity of 50,000 horse-power, a wheel pit with a capacity of 50,000 horse-power, and 20,000 electrical horse-power ready for sale and transmission. However, the works of the company have been constructed on a larger scale than is called for by the requirements of the contract with the government, for to-day the company has a canal, tunnel, and wheel pit complete for the development of 110,000 horse-power.

It is significant of the careful electrical engineering practice of the present time that the two American plants and this new Canadian plant have been considered as one. It is a fact that they can be operated in parallel. Connections have been made between the stations by cables laid in conduits through the Victoria Park and city of Niagara Falls, crossing the river by way of the upper steel arch bridge a short distance below the American Fall, the distance between the plants being about three and a half miles. These connections assure every power customer of these two companies, no matter whether they are on the American or Canadian side, continuity of service. Under the contract, one-half of the power product of the Canadian plant must be supplied on the Canadian side of the river, should there be a demand for it. All the power is to be used outside of Victoria Park.

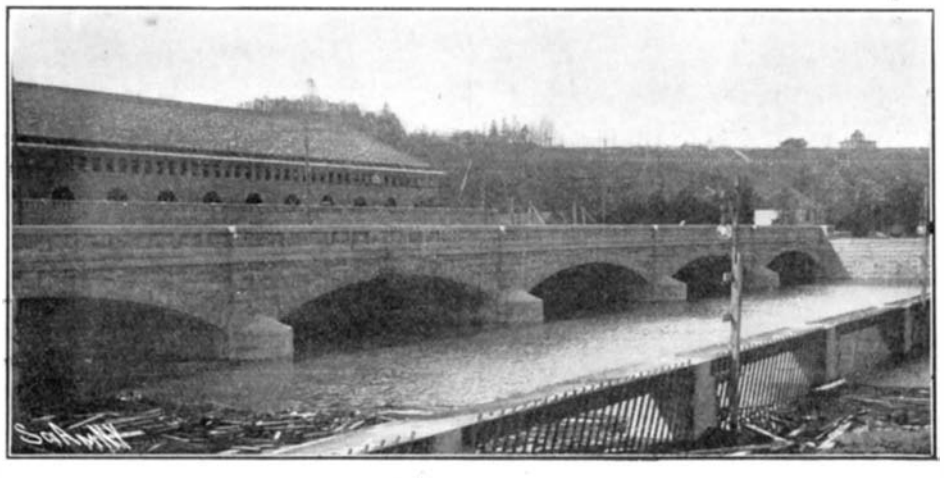
The new generators were made by the General Electric Company, while the turbines were designed and manufactured by Escher, Wyss & Co., of Zurich, Switzerland. The generators are wound for 12,000 volts, three-phase, 25-cycle current at 250 revolutions per minute, this high voltage being selected not for transmission, but for economy in distribution in the vicinity. For long distance transmission, the voltage will be raised to 22,000, 40,000 or 60,000 volts. The generators are of the internal revolving field type, the revolving field ring being built up of punched laminations, bolted together, with joints lapped. The weight of the revolving part of the machine is about 141,000 pounds. The over-all diameter of the new generator is about 19 feet. The electric current sent to the New York side from this Canadian plant will be changed



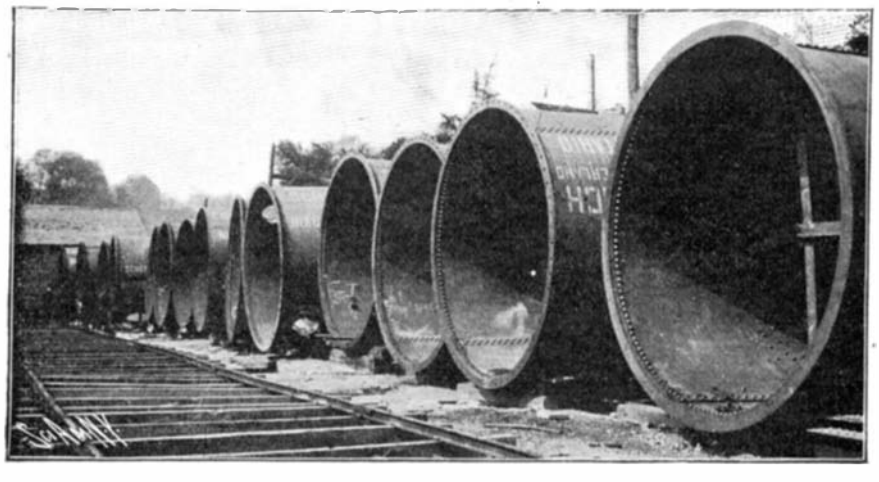
One of the Masonry Culverts, by Which Water is Led from Forebay to the Top of the 10-Foot Penstocks.



Three of the 10,000-Horse-Power Generators in the Power Station.



The Screen for Preventing Entrance of Drift and Ice to the Forebay, the New Bridge, and the Power Station.



Sections of the 10-Foot Penstocks, Through Which Water is Conveyed from the Forebay, Vertically, to the Turbines at the Bottom of the Wheelpit.

by step-down transformers located on that side to 2,200 volts, two-phase, for paralleling, or, if it is so desired, will be delivered direct to tenants of the Niagara Falls Power Company.

Because it was first to project a power development on the Canadian side of the river, the Canadian Niagara Power Company had the pick of sites. It located 2,200 feet back from the brink of the Horseshoe Fall. Its power house is a handsome stone building with covered forebay. The wheel pit is much like the pits on the New York side, and, like them, was cut out of solid rock. The tunnel of the Canadian Niagara Power Company is slightly larger than the tunnel of the Niagara Falls Power Company, but it is about 5,000 feet shorter, a fact of considerable economy in construction. The tunnel is lined throughout with concrete and specially burned brick. Its portal is very close to the foot of the Horseshoe Fall, and when the rush of water pours from it, it is likely to have its influence on the currents of the lower river.

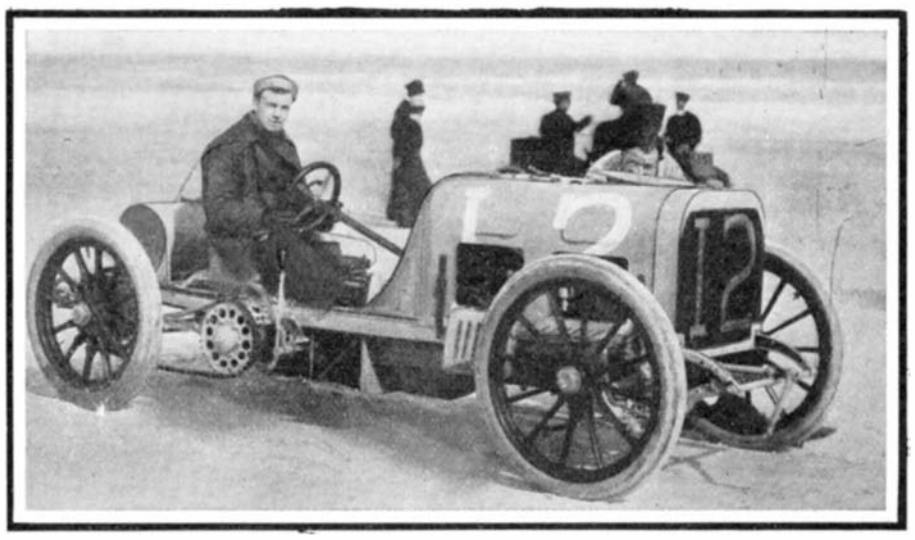
THE ANNUAL AUTOMOBILE RACE MEET AT ORMOND, FLORIDA.

The week of racing on the Ormond-Daytona beach, which seems to have become a fixed event taking place annually the last week in January, was productive of some very fast speeds and numerous new records. The various events were run off successfully, notwithstanding that the death of Mr. Frank H. Croker and his mechanic the previous Saturday, due to the overturning of his car when traveling at high speed—an accident which resulted from his trying to make a sharp turn to avoid a motor cyclist who swerved into the pathway of the car—cast a gloom over all the races.

The events run off the first day were chiefly races for stock cars. The kilometer for machines weighing from 851 to 1,432 pounds (Class B) was won by a 15-horse-power White steamer in 44 2-5 seconds. A. Le Blanc's 20-horse-power Darracq was second in 1 minute, 1 4-5 seconds. The 5-mile races for cars costing from $2,751 to $4,000 and from $4,000 to $6,000 were both won by Charles Soules in a 30-horse-power Pope-Toledo in 5:13 3-5 and 5:17 3-5 respectively. A 5-mile handicap race was won by an 18-horse-power Columbia car in 7:18 1-5, with the above-mentioned Pope-Toledo second in 7:28 4-5.

The most interesting event of the first day was a series of 5- and 10-mile trials against time, in which the shorter distance was covered in 3 minutes and 17 seconds by Arthur McDonald, on a six-cylinder, 90-horse-power Napier racer. This beat Mr. W. K. Vanderbilt's record of 3:31 1-5, made last year on a 90-horse-power Mercedes, by 14 1-5 seconds, and represented a gain in average speed of 6.07 miles per hour with a car having nominally the same horse-power. McDonald's average speed was at the rate of 91.37 miles an hour. In a 10-mile record trial, Bernin, on W. Gould Brokaw's 60-horse-power Renault, made 5 miles in 3:51 3-5 and the total distance in 7:42. The 10-mile races for stock cars in the $2,751-$4,000 and $1,001-$1,800 classes were won in 10:35 3-5 and 14:12 3-5 by the 30-horse-power Pope-Toledo and the 18-horse-power Columbia cars respectively.

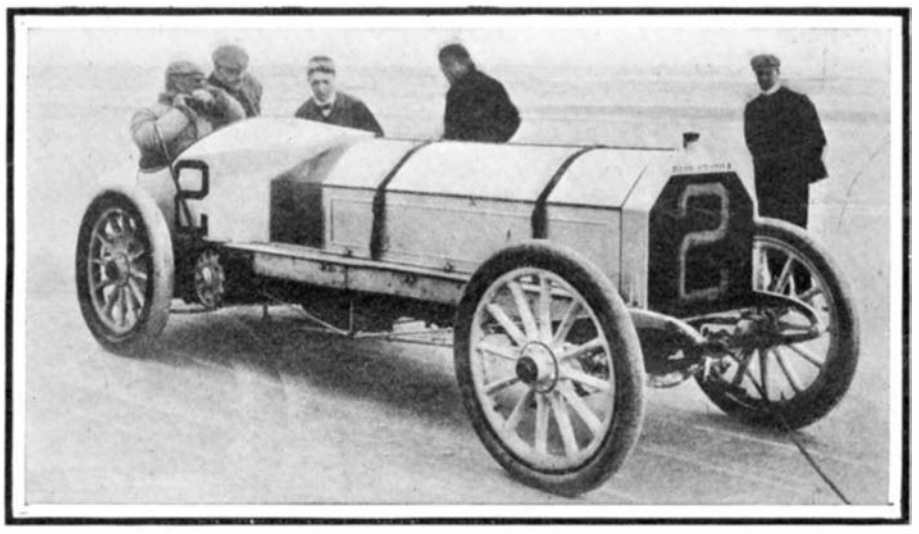
The second day of the races saw the making of new mile and kilometer records by the Napier 90-horse-power car and Bowden's 120-horse-power Mercedes—a specially-constructed machine having two four-cylinder, 60-horse-power Mercedes engines. This car covered a mile in 34 1-5 seconds, or at the rate of 105.26 miles an hour, while the Napier was only 1-5 second longer in making this distance, which it traversed at the rate of 104.65 miles an hour. The Bowden machine weighs 2,650 pounds, and is thus over the weight limit of 1,000 kilogrammes (2,204 pounds). It is also a specially-constructed racer and not a regularly-built car. Therefore its record is in a special class, and the Napier holds the record for standard cars. The speeds of both in the mile trials are the highest that have thus far been made. In the kilometer (0.621 mile) trials, the Napier made the distance in 23 seconds (only 1 2-5 seconds less than the record abroad) and the Bowden Mercedes in 23 3-5. Ross, in a special steam torpedo racer, covered this shorter distance in 24 1-5 seconds and the mile in 38 seconds. In a competitive event of 1 kilometer for the Bowden trophy, McDonald on



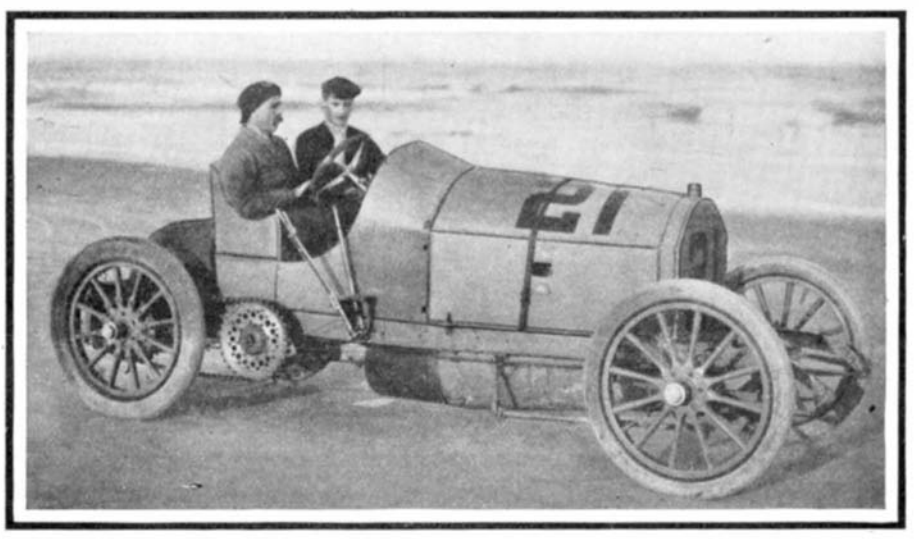
Frank Croker on His 75-Horse-Power Simplex Machine.

Copyright, 1905, by Burr McIntosh.

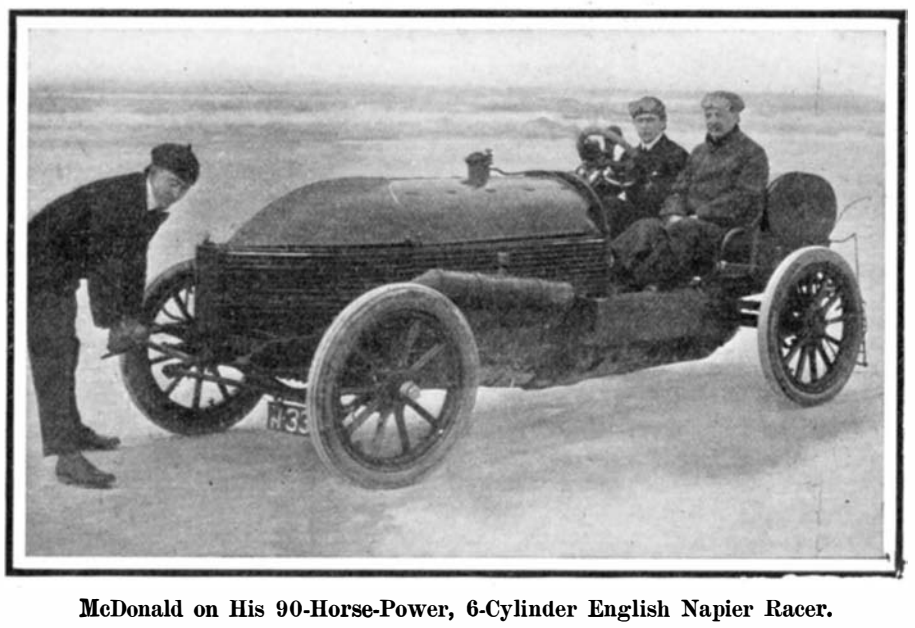
Croker's Wrecked Simplex Car.



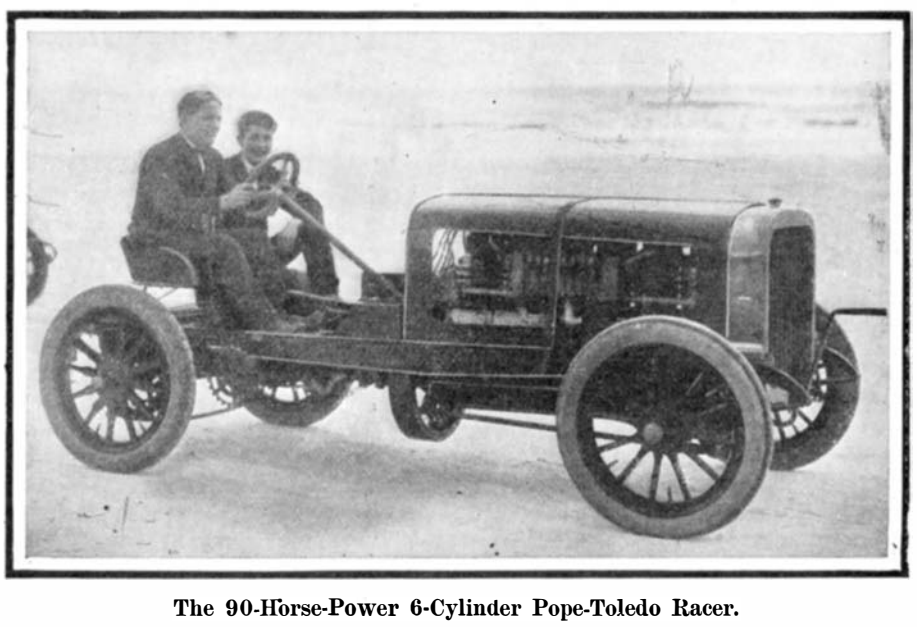
Bowden on His 120-Horse-Power 8-Cylinder Mercedes.



Sartori on A. G. Vanderbilt's 90-Horse-Power Fiat Racer.



McDonald on His 90-Horse-Power, 6-Cylinder English Napier Racer.



The 90-Horse-Power 6-Cylinder Pope-Toledo Racer.

A safety device for the protection of persons from the electric current, upon the rupture of a trolley wire, has been placed on the market. By the employment of this arrangement the current is cut off and the wire rendered harmless. The device is fitted to each section of the wire, and consists of an ordinary connecting ear, held in its proper position by the strain on the trolley wire. Directly this tension is released, as by the breaking of the trolley wire, the current is immediately cut off the broken section without any showing of sparks whatever.

the Napier won the final in 27 3-5 seconds, thus establishing a new American record for the distance in competition. Ross was second in 28 1-5, Stevens on a 90-horse-power Mercedes third, in the same time, and W. Wallace on a 90-horse-power Fiat fourth in 30 seconds.

The mile championship race for the Dewar trophy, run in three heats and a final, was won by Ross on his steam torpedo in 42 seconds. McDonald was second in 42 3-5 seconds. He also won the first heat in 41 3-5 seconds. Wallace won the second heat in 49 seconds, and Oldfield, on the 60-horse-power Peerless, the third in 49 3-5.

The only long-distance event that took place up to Saturday, January 28, was that for the Lozier trophy, a 50-mile race for American cars only. This race was run off on the 27th ultimo, and was won by Walter Christie with his novel 70-horse-power racer, on which the motor is placed transversely and forms the front axle. Christie had as competitors A. C. Webb on a 90-horse-power Pope-Toledo racer, which is entered in the next Gordon Bennett race, and Barney Oldfield on the 60-horse-power Peerless racer which holds so many track records. All three cars had breakdowns, and the race was virtually an obstacle race against time. Webb had trouble with his commutator, and dropped out at the end of 10 miles. Christie also had electrical troubles, which delayed him some 20 minutes. Oldfield turned at the 10-mile post instead of at the 12½-mile one, and, after returning to the starting point with a rear tire off, he started anew, but later abandoned the race. Christie was the only one to finish. He ran the last 25 miles through spray, dashing up from the rising tide, in 26 minutes, 48 2-5 seconds, and his time for the entire distance, including stops, was 1 hour, 11 minutes, 22 2-5 seconds. A full description of the Christie racer and of the McMurtry timing apparatus used at Ormond was published in the Automobile Number of this journal one week ago.

A special 10-mile match race between a 40-horse-power Decauville and a 40-horse-power Bollée was the only other race of interest on the 27th ultimo. This was won by the former machine, driven by Guy Vaughn, in 9:20 1-5, with the other machine only 5 3-5 seconds behind at the finish. The races were all run with difficulty because of the tide receding but little, and giving but a very narrow stretch of beach on which to run them.

An interesting sub-aqueous engineering feat has been achieved in the successful laying of a submerged water main at a depth of 86 feet across the channel in Cork Harbor, Ireland, separating Queenstown from Haulbowline. The work was attended with several difficulties, among which the great depth of water and the irregular nature of the bed of the harbor, which consists of jagged limestone rock, were the most important, and at first it was deemed by many experts to be impossible. The submerged main measures about 2,000 feet in length, and consists of specially cast pipes of 6 inches internal diameter.

Of the iron ores mined in the United States in 1903 it is estimated that 86.6 per cent were red hematites; 8.8 per cent brown hematites; 4.5 per cent magnetites; 0.1 per cent carbonates. The line between the red and brown hematites is, however, not clearly defined.

NEW SYSTEM OF EGG TRANSPORTATION.

BY GEORGE J. JONES.

The egg men of this country have recently had called to their attention a new method of shipping and handling eggs, which has already been adopted to a considerable extent, and the use of which is becoming more and more general. Quite a large factory is maintained at Scranton, Pa., in the manufacture of the devices known as "Zinkets," which are the foundation of the new system. These zinkets are tray-like constructions of metal made by mechanical methods, each one of which holds one dozen eggs, and it is designed that the eggs shall be placed in these carriers at the time of their gathering on the farm, and in them they shall remain until such time as it is proposed to prepare them for consumption. When the zinket is empty, it is laid aside and returned to the dealer when a supply of fresh eggs is being secured.

This system is said to have a number of advantages over the method of packing the eggs in horizontal layers with the aid of pasteboard fillers, as is done at present. In the first place, the zinket offers a most convenient means for carrying and handling the eggs through all of the various processes through which they must pass from the farmer to the consumer. Secondly, the transportation of the contents of these packages is effected more safely than by the old methods, and the packages are smaller than those of corresponding capacity in use at present.

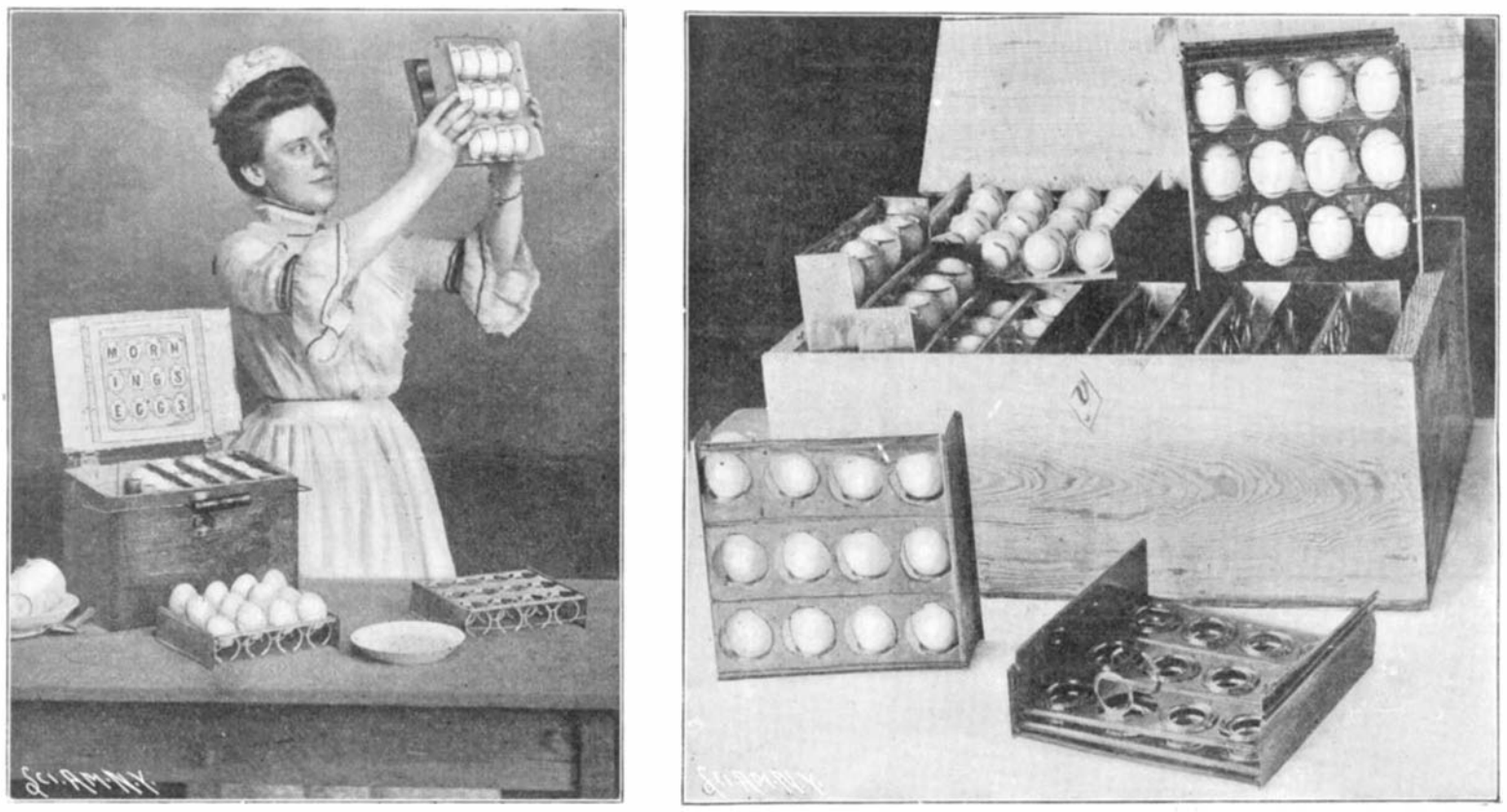
It has been said that the carrier is the basis of the new system. This is cut out of a roll of sheet metal, preferably steel, in an oblong shape, with twelve round holes placed regularly in the center. These shapes are then electroplated with zinc, as this is the most cleanly and desirable for the device. By subsequent passages through special machinery, these holes are enlarged by cutting at the top and bottom. The strips thus formed are afterward bent out from the metal body, and form clips over and under the hole, for the purpose of grasping the egg. The ends of the metal are then bent so as to form something of a tray, the ends being grooved to enable one of these devices to fit tightly in another. Thus, when packed, they are slipped into suitable boxes, vertically instead of horizontally. When in transit in this manner, the spring-like qualities of the clip consume all ordinary shock, and prevent the eggs from being broken. A very severe blow is required to dislodge the eggs from their resting places.

By this vertical arrangement of the trays, it is easily possible to examine and even count the contents of the box in a few minutes. For candling, the eggs may be examined in their places, and by a simple apparatus invented for the purpose, the entire dozen of eggs may be carefully examined almost at a single glance. This is done without disturbing them from their places between the clips.

The safety of carriage is a feature which appeals to the dealer, and another important factor is the economy of space shown by the zinket system, for the carriers pack very closely. In shipping or storage they actually occupy one hundred cubic inches less space per thirty dozen eggs than the pasteboard filler system. A feature which appeals to the consumer very strongly is the means afforded for the identification of goods. On each of these carriers the name and address of the owner must be stamped, in order that they shall find their way back to him. This enables the careful housewife to know just where her eggs came from. She will soon become familiar with the names of the farmers supplying her dealer, and she will reject the packages of any of those in which she has at any time found unworthy goods.

These devices have been already extensively used by fancy farmers, who supply what is known as "morning eggs." For infants and invalids it is often desired to have eggs that have been laid on the day of delivery. Here these carriers are the hasty messengers from the poulterer to the pantry. In order to give patrons further assurance of the quality of the contents, a strip label is pasted across each row of eggs in such a manner that it is impossible to remove one of the eggs without destroying the label.

After the package has been delivered to the house it is placed in the refrigerator, still in the zinkets, and in this shape it takes up much less room than the usual bowl. If it is desired to boil the eggs in numbers, as for a large family or restaurant, the entire arrangement is placed in the boiling water, and thus they are all cooked to exactly the same degree, a thing which has not been possible before without the use of some expensive device of a special nature.



A NEW SYSTEM OF TRANSPORTING EGGS.

Astronomical News.

A telegram has been received at the Harvard College Observatory from Prof. Kreutz, at Kiel Observatory, stating that a planet of the thirteenth magnitude or ftr. was discovered by Wolf at Heidelberg, January 22, and that it was observed by him January 23d. 2735, Greenwich mean time in R. A. 1h. 31m. 59s., and Dec. 36m. 13s. Daily motion in R. A. + 1m. 32s. and in Dec. +0° 9m. It is supposed to be Perrine's satellite of Jupiter.

NOTE.—In a letter dated January 13, 1905, Prof. Campbell writes: "Unfortunately, we have had only one or two breaks in the clouds since the announcement was made, but the two short exposures show the satellite where it was expected to be."

A telegram has been received at the Harvard College Observatory from Prof. W. W. Campbell at Lick Observatory, stating that the sixth satellite of Jupiter was observed by Perrine January 17d. 702 G. M. T. Its position angle with reference to Jupiter was 266 deg. and its distance 36m. Wolf's asteroid has no connection with the sixth satellite.

The following story is published in Machinery: A circus train was pulling out of Spokane, Wash., a few weeks ago when suddenly the injector "broke" and persistently refused to take up water. After working with it a few minutes the engineer ordered an examination made of the tank; it was found nearly empty, although filled at the water crane but a short time before. No explanation of this mystifying condition was apparent until water in numerous streams was seen running from the elephant car next to the tender, and then the cause was found. "Jumbo" had amused himself by reaching his trunk through the open end of his car into the manhole of the tender and sucking up the water, with which he had deluged the other animals in the car. They looked like "drowned rats," and needless to say had enjoyed their involuntary baths no more than the trainmen had the delay.

HOPKINS "BAND ELECTRO-CHRONOGRAPH," CAPABLE OF DIVIDING A SECOND OF TIME INTO ONE HUNDRED THOUSAND AND ONE MILLION PARTS.

The following description and illustrations are taken from the fifth practical article on "Experimental Electrochemistry," by Prof. N. Monroe Hopkins, of the George Washington University, Washington, D. C., published in SCIENTIFIC AMERICAN SUPPLEMENT No. 1517. The article in question is one of a series now running in the SUPPLEMENT. As this new form of high-speed chronograph undoubtedly has other applications than that for which it was designed, namely the study of electrolytic conduction, we deem it of sufficient interest to reproduce a description of this piece of apparatus here.

Figs. 1 and 2 represent the rear and side view of such a band chronograph respectively, which, as will be seen, is direct-driven by a high-speed electric motor. A paper band passes over the chronograph cylinder, and extends over a distance of about ten feet to a loose-running drum-wheel. Were it not for this novel feature, a momentary contact of the pencils carried by the armatures of the two electromagnets shown, would result in a line drawn completely around the chronograph cylinder at the enormous speeds the instrument is designed for, and it would be impossible to tell where the contact was first made. In order to produce a clear record of the times of actually making contacts by the two electro-magnets, Prof. Hopkins introduces a long band of paper, some twenty feet in length, which prevents a line being drawn upon itself even when the cylinder is revolving from 2,000 to 20,000 revolutions per minute, the contact of course being only momentary. With such an arrangement the times of striking of the two electro-magnets, which are upon different circuits, may be studied. Fig. 3 illustrates a chronograph for the highest speeds. Here at the left an electric motor of two horse-power is shown belted up for multiplication of speed to a countershaft, also belted for speed to the chronograph cylinder. In the foreground fifty feet of electrolyte is represented in glass tubes arranged like a hot-water radiator. The diagram in Fig. 4 will make the plan of connections and operation clear. For example, *A* and *B* stand for an electrolyte and wire respectively, arranged for studying their electrical conductivity. *D* is a sensitive ammeter for reading the current flow through the electrolyte with which it is in series and the electro-magnet *E* of the chronograph and the source of electricity, which is reached through the switch *H*. *C* is a rheostat of the non-inductive variety, for bringing the circuit including the wire *B* to the same resistance as the circuit containing the electrolyte *A;* and *F* represents in dotted lines the same delicate ammeter shifted in series with the wire and the electro-magnet *G* of the chronograph, and the source of electricity through the same switch *H*. Having "balanced" the two circuits perfectly, by making them of exactly the same resistance, the chronograph cylinder is speeded up, and when the desired speed has been reached the switch is thrown, and the two electro-magnets allowed to strike their records upon the flying band. Any differences in time of conductivity between the two classes of conductors may be calculated from the differences in length of the two record lines, or rather their points of contact. In the article in SUPPLEMENT No. 1515, electrolytes of different constitutions are studied, compared with each other as well as to wires. Interesting evidence in support of the electrolytic dissociation theory is also advanced, and methods of determining the absolute velocities of ions are given.

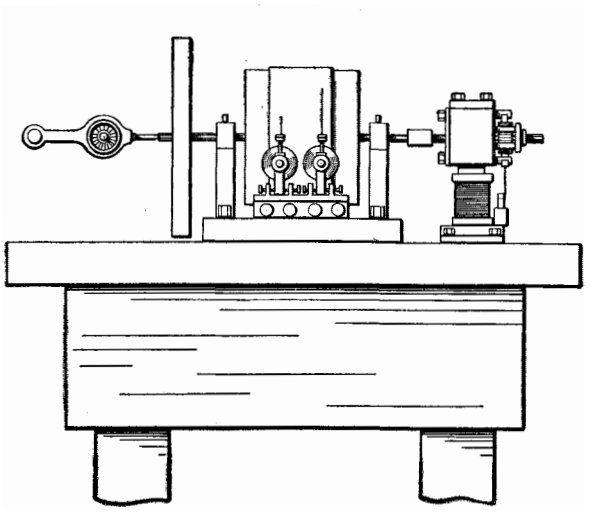


Fig. 1.—REAR VIEW OF HOPKINS HIGH-SPEED BAND ELECTRO-CHRONOGRAPH.

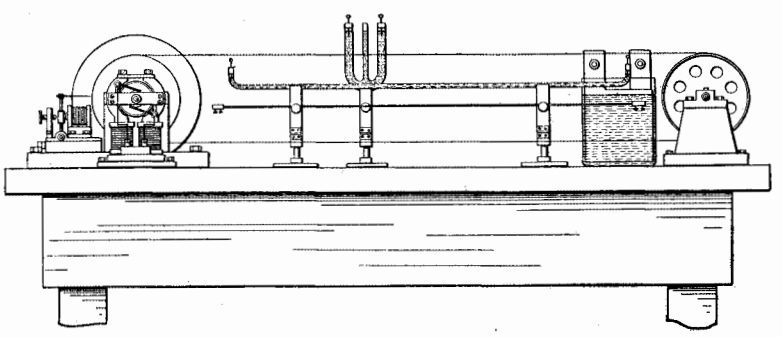


Fig. 2.—SIDE VIEW OF THE INSTRUMENT.

Lake Traffic Passing the "Soo."

The United States engineering office at Sault Ste. Marie, Mich., reports the following information regarding lake commerce through the American and Canadian canals at Sault Ste. Marie, Mich., and Ontario, for the month of December, 1904: Number of net tons east-bound freight, 816,973; west-bound freight, 153,892 net tons. The total number of vessels passing through the United States canal was 242, and through the Canadian canal, 144. The total registered tonnage through the United States canal was 489,442 net tons, and through the Canadian canal, 129,888 net tons. The number of bushels of grain other than wheat passing the United States canal, east-bound, was 4,963,571, and the Canadian canal, 15,000. The number of net tons of iron ore passing the United States canal was 334,861, and the Canadian canal 29,054. The number of bushels of wheat passing the United States canal was 5,119,843, and the Canadian canal 2,948,707. The number of barrels of flour passing the United States canal was 256,360, and the Canadian canal 146,724. The quantity of lumber passing the United States canal was 15,389 M. feet B. M., and the Canadian canal 223 M. feet B. M. The shipments of general merchandise passing the United States canal amounted to 1,193 net tons, and through the Canadian canal 182.5 net tons. In west-bound traffic there was 19,300 net tons of hard coal passing through the United States canal, and not any through the Canadian canal; 87,520 net tons of soft coal passing through the United States canal, and 26,302 net tons passing through the Canadian canal; 5,611 net tons of general merchandise passing through the United States canal, and 6,728 net tons passing through the Canadian canal. There were no passengers through the United States canal, west-bound and 35 through the Canadian canal; 18 passengers east-bound through the United States canal, and 90 through the Canadian canal.

The United States canal was opened May 5 and closed December 13, 1904; season, 223 days. The Canadian canal was opened April 30 and closed December 25, 1904; season, 240 days. The following is a statement of the traffic for the season of 1904; Number of net tons east-bound freight, 24,213,902; west-bound freight, 7,332,204 net tons. The total number of vessels passing through the United States canal was 12,153, and through the Canadian canal, 3,967. The total registered tonnage through the United States canal was 20,160,042 net tons, and through the Canadian canal 4,204,096 net tons. The number of bushels of grain other than wheat passing the United States canal, east-bound, was 27,877,071, and the Canadian canal, 5,148,372. The number of net tons of iron ore passing the United States canal was 17,207,260, and the Canadian canal 2,428,537. The number of bushels of wheat passing the United States canal was 20,248,392, and the Canadian canal 29,684,477. The number of barrels of flour passing the United States canal was 2,774,863, and the Canadian canal 1,935,325. The quantity of lumber passing the United States canal was 894,324 M. feet B. M., and the Canadian canal 28,956 M. feet B. M. The shipments of general merchandise passing the United States canal amounted to 57,038 net tons, and through the Canadian canal 38,336 net tons. In west-bound traffic there was 880,417 net tons of hard coal passing through the United States canal, and 110,811 net tons passing through the Canadian canal; 4,589,501 net tons of soft coal passing through the United States canal, and 874,140 net tons passing through the Canadian canal; 419,390 net tons of general merchandise passing the United States canal, and 217,245 net tons passing the Canadian canal. The number of passengers through the United States canal, west-bound, was 12,029, and through the Canadian canal 5,789; passengers east-bound through the United States canal 9,577, and through the Canadian canal 10,300.

The fleet of nine steamers which the Belgian government maintains for the cross-Channel service is to be increased by the addition of a turbine steamer with a speed of 23 knots. It is said that Belgium intends to replace gradually all the old steamers of a speed of 19 knots by turbine steamers similar to that to be introduced shortly. The new steamer is to be fitted up splendidly. Among other conveniences it will carry a Marconi apparatus and a searchlight.

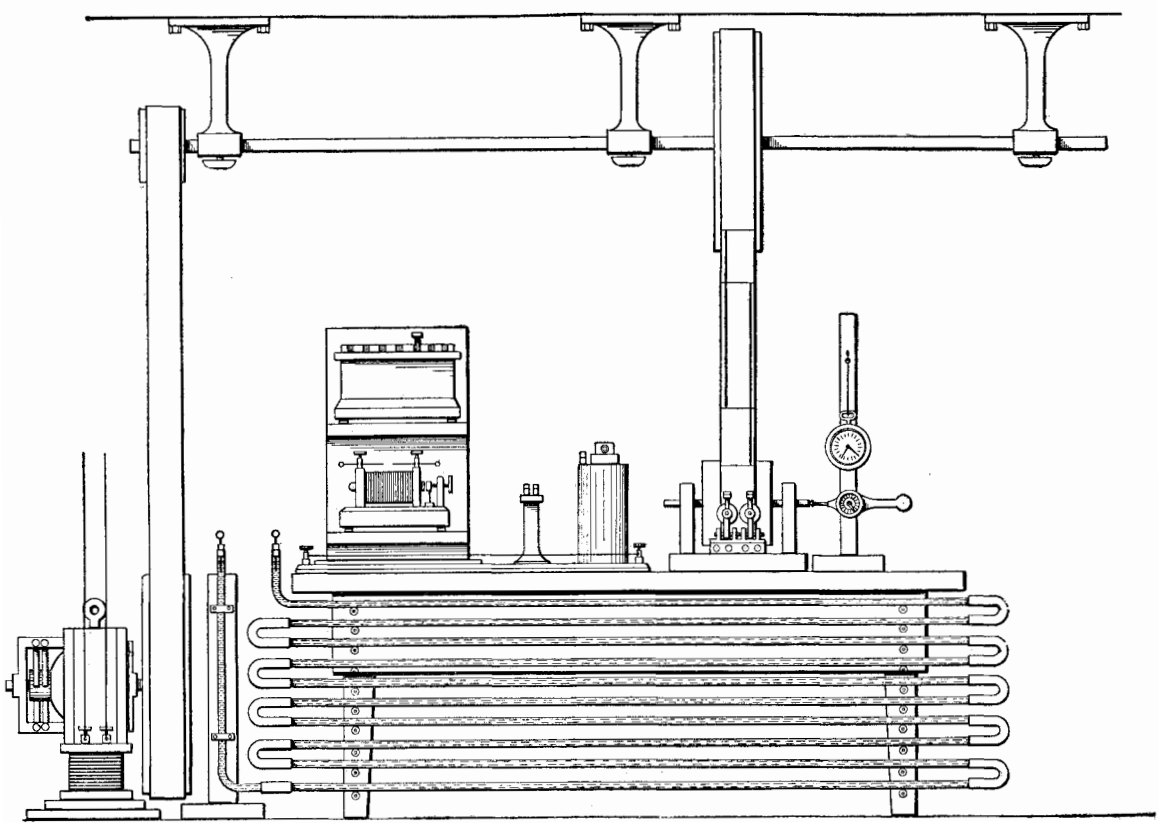


Fig. 3.—ILLUSTRATION OF BAND CHRONOGRAPH FOR HIGHEST SPEEDS AND CAPABLE OF DIVIDING A SECOND INTO ONE MILLION PARTS.

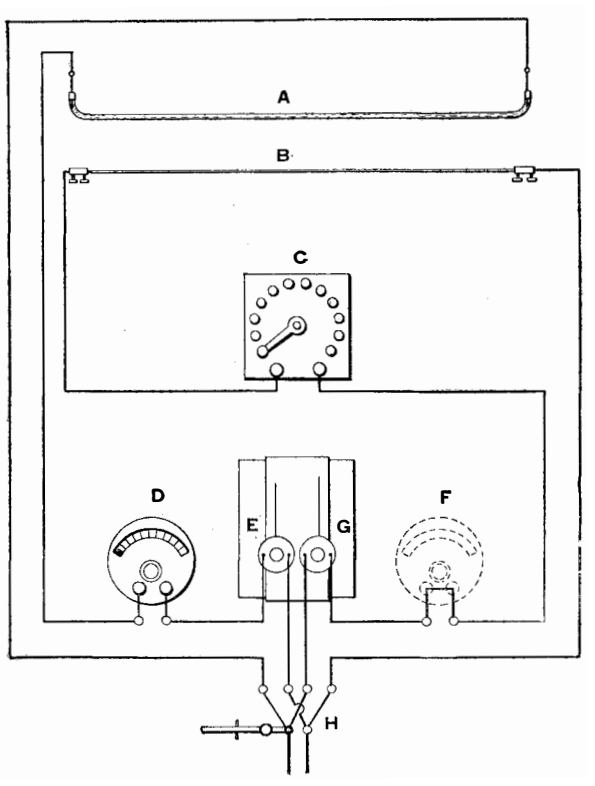


Fig. 4.—DIAGRAM OF CONNECTIONS OF BAND ELECTRO-CHRONOGRAPH.

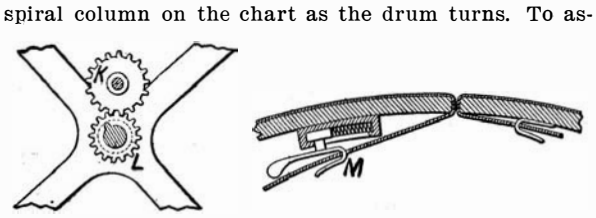
AN IMPROVED FIRE ESCAPE.

A convenient type of fire escape is illustrated in the accompanying engraving. The apparatus is very compact and simple, as will be seen from the following description of its construction. It comprises a casing provided with a fixed central shaft, on the lower end of which a reel drum is mounted to rotate. A rope is coiled on the drum, with its free end extending upward through a thimble at the top of the casing. The upper face of this drum is formed with an internal gear which, through a train of step-up gearing, serves to rotate a governor, mounted on the upper end of the fixed shaft. Secured to the upper end of the governor is a friction disk, which is adapted to engage a similar disk on a fixed shaft, when it is desired to brake the rotation of the reel drum. The mechanism for pressing the two disks together is clearly shown in the fragmentary detail view. A crank handle *A*, at the upper end of the casing, is connected by a shaft with a cam *B*, which bears against the clutch-block *C*, pivoted to the casing. The block *C* is formed with a V-shaped notch adapted to engage the beveled faces of the disks *D*. By turning the crank, the swell of the cam is brought to bear on the clutch, locking it against the disks and pressing them together. In use, the free end of the rope is made fast to the window casing, or to any suitable fixture in the room. A strap is then passed through the ring eye on the bottom of the casing, and strapped about the hips and waist of the person about to use the fire escape. A reliable and safe descent can now be made, the rope slowly uncoiling as the drum rotates under control of the governor. If it be desired to stop the fire escape at any time, to rescue another person at a lower window, the brake may be easily applied by turning the crank handle. The rope may be recoiled on the drum by operating the crank at the bottom of the casing, which turns the drum through the medium of a pair of gear wheels. The train of gearing which connects the drum with the governor comprises, in addition to the gearing, a pawl and ratchet adapted to disconnect the governor when the reel drum is turned to recoil the rope. The inventors of this fire escape are Messrs. Bergvin Johnson, John W. Smith, and Barney Johnson, of Congress, Arizona, P. O. Box 81.

A CONVENIENT FIRE ESCAPE.

VEHICLE ATTACHMENT FOR KEEPING RECORD OF DRIVER'S WORK.

A clever invention, which we illustrate herewith, has recently been patented by Mr. Harry Hencken, 8 West 121st Street, New York. It consists of a small device, which may be attached to any vehicle to keep a record of the driver's work. The record shows just how long the vehicle was in motion, and also how long it was standing still. The mechanism of the device is contained in a casing supported by coiled springs, connected with brackets *H*, which are attached to the vehicle at any convenient point. Owing to this spring support, the device will respond to any vibration of the vehicle. Within the casing is a drum *A*, with an internally-threaded hub, which is mounted on a fixed shaft *C*. The latter is also threaded for a short length, to engage the internal thread of the hub. The outer face of this hub is formed with teeth, extending longitudinally along its entire length. As shown in one of our detailed views, this toothed hub *L* is engaged by a gear wheel *K* of a clock mechanism contained in the casing *B*. The clock mechanism slowly turns the drum *A* on its axis and, due to the threaded connection with the shaft *C*, the drum is also caused to move outward thereon. Carried on the face of the drum is a chart, the ends of which are passed through a slot therein, and fastened by means of hooks on the under side. One of these hooks *M*, as shown in the detailed view, is pressed backward by a spring, which serves to hold the chart taut on the drum. Secured to the casing above the drum is a leaf spring, which carries at its free end a marking point *D*, adapted to be vibrated against the chart by the jarring of the vehicle when in motion. A fixed bar extending above the spring carries a block *E*, formed with a slot through which the spring passes. By moving the block out to the end of the bar, the vibration of the point *D* will be prevented. In operation, this block having first been moved back, a series of dots will be marked on the chart while the vehicle is in motion. The clockwork, which may be wound up at *F*, causes the drum *A* to make one complete turn every four hours, and the chart thereon is divided by four heavy lines to indicate the hours. These spaces are subdivided to indicate the minutes, and thus the length of time the vehicle has been in motion is indicated by the length of the line drawn by the vibrating marker. But the record is not limited to a period of four hours, because the drum moves forward slowly along its axis while rotating, so that the marker engages a continuous spiral column on the chart as the drum turns. To assist in reading the record two scale plates are provided, one at each side of the casing, by which the outward movement of the drum may be measured.



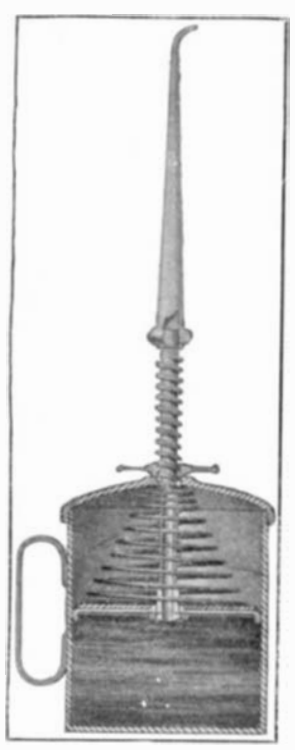
DETAILS OF THE VEHICLE ATTACHMENT.

AN AUTOMATIC DOOR ALARM.

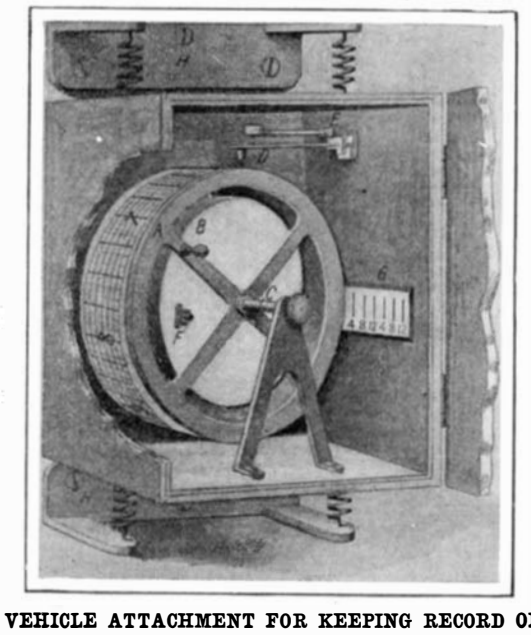
Door alarms are commonly worked by a spring or an electric battery, the action of which is controlled either by opening the door or by turning the door-knob. The objection to such alarms is that the spring must be frequently wound or the battery renewed, else the motive power may be exhausted at the time when it is most needed. But a new type of door alarm has recently been invented, in which neither spring nor battery is used as a motive power. Instead the alarm is operated directly by the turning of the door-knob. This door alarm is illustrated in the accompanying engravings. In the detail view the gong is removed to show the mechanism of the alarm. The alarm proper is secured to the door at a point adjacent to the door-lock. Clamped to the knob-spindle by means of split ring *A* is a toothed sector *B*. This is arranged to operate, through a train of step-up gearing, a disk *C*, which is mounted to turn on the central stud that carries the gong. The disk *C* carries a number of hammers *D*, that are pivoted thereto by means of screws which pass through slots in the shanks of the hammers. The movement of the hammers is limited by pins which project from the face of the disk. In operation, when the door-knob is turned, the sector *B* turns with it and, through the medium of the step-up gearing, rotates the disk *C* very rapidly, causing the hammers to fly outward by centrifugal action and strike against ribs formed on the inner face of the gong. In this way the gong is sounded, giving the alarm when any one attempts to open the door. In order to return the knob to its normal position, the ends of the sector are connected to the main frame by a pair of coil springs. The principal mechanism of the alarm is mounted in an auxiliary frame, which is pivoted to the main frame at its upper end. The lower end of this frame is connected by a spring with the main frame in such manner as to hold the gearing in mesh with the sector. When it is desired to place the alarm out of action, the auxiliary frame is swung away from the sector until the latter clears the train of gearing. In this position it is clamped by a thumb-screw *E*. Mr. Philip Bourne, of 1690 Lexington Avenue, New York city, N. Y., has recently secured a patent on this invention.

OIL CAN WITH MEANS FOR CONTROLLING DELIVERY OF OIL.

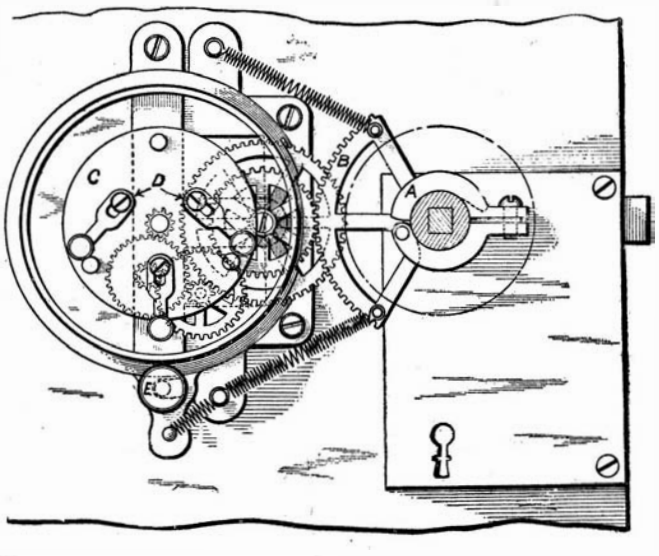
We illustrate herewith an improved oil can, which has recently been invented by Messrs. William Morris and Charles A. McClair, of Index, Wash. This can belongs to that type used in lubricating machinery, and is provided with means for positively controlling the delivery of the oil. The can is formed with a main or body section and a cap screwed thereon. Within the can is a piston formed of two supporting disks, between which is a packing disk with cupped edge that closely engages the wall of the can. The piston is provided with a hollow piston rod, which projects through the cover of the can and carries at its upper end a suitable nozzle, threaded thereto. The outer surface of the piston rod is formed with a helical thread, upon which is mounted a threaded adjusting wheel. A spring is interposed between the piston and the cover of the can, pressing the former down as far as permitted by the adjusting wheel, which bears against the upper face of the cover. It will be observed that the spring is of the helical type, that is, toward the base the coils increase in diameter, so that it will fold up into a very small space, permitting the piston to be raised to the top of the can. The can may be filled with oil by removing the cap and the piston; but a preferable method is to remove the nozzle, immerse the end of the hollow piston rod in oil, and draw the piston out so as to produce a vacuum in the oil chamber, which will immediately fill with oil, flowing in through the bore of the piston rod. The piston should then be held up by screwing down the adjustment wheel. In use, by turning the adjusting wheel so as to permit the piston head to feed downward, the oil will be forced up through the hollow piston rod, and out of the nozzle. To check the flow, the movement of the adjusting wheel may be reversed, relieving the pressure on the oil, or the same effect may be more quickly produced by pulling the nozzle outward against the force of the spring. With each oil can a number of nozzles may be provided, which could be especially adapted for difficult purposes.



OIL CAN WITH MEANS FOR CONTROLLING DELIVERY OF OIL.



VEHICLE ATTACHMENT FOR KEEPING RECORD OF DRIVER'S WORK.



DETAILS OF THE AUTOMATIC DOOR ALARM.

AUTOMATIC DOOR ALARM.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

PROTECTIVE DEVICE FOR THIRD RAILS.—J. RYAN and A. C. GUNTZER, New York, N. Y. The purpose of the invention is to provide a cover or protective casing for the third rail of electric road, which will prevent persons from accidentally coming in engagement with the rail, the cover being so constructed as not to interfere with the action of the shoe. The invention provides a casing readily applied and so constructed that access can be gained to the rail at any time in an expeditious and convenient manner without removing the cover from its protective relation to the rail.

SUPPORT FOR TELEPHONE-RECEIVERS.—F. F. HOWE, Marietta, Ohio. This invention is an improvement in telephone-receiver supports, and has for an object the provision of a novel construction for supporting the receiver so constructed that when the receiver is released after being used it will operate automatically to close the switch of the telephone and cut out the receiver.

TRACK-SWITCH FOR ELECTRIC RAILWAYS.—G. H. FREETS, Springfield, Mass. The invention relates to electric-railway switches, Mr. Frests' more particular object being to produce a type of switch which may be advantageously controlled from a moving car. Where a part of the current is used for auxiliary purposes—such as lights, heating, and air-brakes—he makes the magnet-wire heavy, so that the magnet is not affected by the current used for these auxiliary purposes.

Of Interest to Farmers.

WINDMILL-REGULATOR.—T. A. OVERBY and J. G. OVERBY, near Mellette, S. D. The objects of these inventors are to provide means whereby the mill is automatically started when the water in the tank is lowered and stopped when enough is pumped in, and requiring but small floats; means to automatically stop a mill when the well gets empty and start when water in the well rises to a predetermined level; means to stop action of pump-rod lever when mill is in action; means to put pawls into engagement instantly; means to put mill in or out of gear by hand and hold it so; to provide efficient regulator without springs; and means to keep the mill wire from getting tangled when a violent breeze turns the vane around and slackens the wire, etc.

HAY-STACKER.—L. OBERWETTER, Gordon, Neb. One purpose of this invention is to provide a form of stacker so constructed that the fork is counterbalanced by means of a weight which assists in raising the fork and prevents a too violent return of the fork to receiving or normal position and to so mount the pivoted supports for the fork that when the fork is brought to its full upper position it will yet be at one side of the perpendicular, inclining sufficiently from the stack to give the fork an automatic downward impulse in direction of its initial position.

COTTON-PICKER.—M. E. LEHMANN, Baton Rouge, La. In this patent the invention relates to a pneumatic cotton-picker; and it comprises certain novel devices for drawing the cotton from the plants and for automatically separating the cotton from the dead leaves and other foreign matter removed from the plants with the cotton.

COTTON-HARVESTER.—R. H. PURNELL, Rosedale, Miss. A principal feature of the machine is the provision of a cutter for severing the stalks and the arrangement of the same upon a vertically-adjustable support and carrier and the special means for effecting the vertical adjustment of the same, which corresponds to the inclination of the surface of the cotton-field or the height of the cotton-ridge relative to the adjacent surface, and also to any obstructions or obstacles, such as stumps or rocks. A dynamo is used for effecting the operation of the stalk-cutting device.

Of General Interest.

BLOTTER ATTACHMENT. — J. W. GRAEME, United States Navy, Washington, D. C. This blotter attachment is used in connection with books, and the inventor does not desire to be limited strictly to permanently-bound books or books in which the leaves are permanently held in place, but he desires to include in such term "book" pads, tablets, and the like, including check-books for bank use, which are provided with leaves and with backs or covers.

CAN.—L. C. SHARP, Omaha, Neb. In this patent the invention has reference to what is commonly called a "key-opener' can, and the improvement is especially adapted to that class of cans which are drawn or stamped up from two integral sections of sheet metal joined by a horizontal medial line, although it may be used in other connections.

SHOE-TONGUE RETAINER.—W. J. ANDREWS, Murphysboro, Ill. The invention relates to footwear; and its object is to provide a retainer for securely holding the tongue of the shoe in proper position on the fly when the shoe is worn to prevent sand, gravel and the like from passing into the shoe, the retainer also serving as identication means of the wearer.

PAINT AND PROCESS OF PRODUCING SAME.—R. WARNOCK, Westboro, Mo. The invention relates to paint compositions, it being particularly adapted for the coating of trees to prevent access of animals and insects. To this end the improvement consists in the compounding of tar, oil, carbolic acid, and asafetida in certain proportions. It is a preventive against ravages of rabbits, mice, and borers, and such insects as canker-worms will not climb the trunks to which it is applied. It is impervious to water, and does not evaporate.

RACK.—J. H. VARTY, Albion, Mich. Mr. Varty's invention relates to racks for various articles, its principal objects being to provide such a device which may be inexpensively made and which will furnish a convenient support for a penholder or other writing utensil. Its base is provided with means for creating a field of magnetic force, consisting of a horseshoe-magnet attached near one end of the base and concealed by a representation of an ink bottle, though any article may be substituted, this being particularly designed as an advertising device. The low cost at which the rack may be made and its great convenience renders it an attractive advertising novelty for gratuitous distribution.

INFANT'S GARMENT.—LIDA C. SHERICK, Lemongrove, Cal. The purpose in this case is to provide a garment adapted either as a slumber-robe or a robe to be worn when desired to especially protect the infant against cold or inclement weather, the robe being so constructed as to completely protect or incase the lower limbs, yet leave them free for motion, and likewise to fully protect the body, especially the chest, without rendering the robe bulky or interfering with the action of the arms.

CIGARETTE-TIP.—H. P. STRAUSE and L. KEHLMANN, New York, N. Y. In the present patent the invention has reference to cigarettes, the more particular object being to produce an improved tip thereby having sanitary and other advantages and being useful for purposes of advertising independently of the usual office performed by the tip. The tip is made long in order to provide the space occupied by graphic symbols.

CONSTANT-LEVEL GAS-METER.—J. R. DUPOY, 36 Rue Guersant, Paris, France. This apparatus automatically maintains a constant level of the water in a gas-meter. It employs buckets mounted upon the exterior of the drum for successively taking up a certain quantity of gas at each revolution of the drum, a chamber in which the gas thus taken up is accumulated, and a reserve water-compartment communicating with the gas-chamber by tubes. The pressure of gas stored in the chamber will produce at intervals a mechanical flow into the drum-casing of the water which during the preceding period of accumulation has entered the tubes.

CENTERING DEVICE FOR CHEESE-CUTTERS.—M. B. IRVINE, Longbeach, Cal. This improvement refers to a device for cutters of the type in which cheese is mounted on a revolving table and is cut by means of a knife supported upon a framework above the table. The object is to provide a device by means of which cheeses may be so centered relatively to the revolving tables of cutters that the center of gravity of the cheese will always be directly above the center about which the table turns, and hence insure proper weight in the slices cut from the cheese.

CORSET.—ELIZABETH CALKINS, St. Joseph, Mo. The intention of this improvement is to obviate the difficulty usually experienced in having objectionable knots at the waist-line, which interfere with the proper adjustment of the outer garments. The invention is further intended to provide such a construction that the ends of the laces will be independent of each other and at the same time be in a convenient position for tightening or loosening and tying the same.

PYROTECHNIC DEVICE.—F. T. BECK, New York, N. Y. In this case the invention relates to improvements in devices for displaying pyrotechnic or luminous objects, an object being to provide a simple mechanical means whereby a plurality of luminous or burning devices may be rapidly rotated and caused to spread apart by centrifugal action to present practically continuous lines of fire.

SIPHON.—P. MCGRATH, Hibbing, Minn. Mr. McGrath's invention relates to an improvement in siphons, and has for its object the provision of a simple and efficient device for withdrawing liquids from vessels having no faucets or other outlets. It comprises a simple means for expelling the air from the siphon by compressing a bulb connected therewith, also a simple device for closing the nozzle of the siphon while the air therein is being exhausted.

Hardware and Tools.

NUT-LOCK.—C. D. CAMPBELL, Marr, Ohio. The object in this invention is to provide a nut-lock of novel construction that may be applied upon any nut to hold it stationary at a desired point on a screw-threaded bolt, avoid injuring the nut or bolt, be adapted for release, if this be desired, and be extremely simple, durable, and inexpensive.

DOOR-CHECK.—C. ELLINGEN, Santa Barbara, Cal. The invention is an improvement in that class of devices employed for holding swinging doors open. It is more particularly an improvement in devices which are adapted to engage the knob of a door-latch. A distinguishing feature is a fixed catch and a door-knob which are constructively so related to each other that when the door swings open the knob is automatically engaged with and locked by the catch and which may be released by turning it a part of a complete rotation.

Household Utilities.

WINDOW-SASH.—S. E. ROE, New York, N. Y. The object of the invention is the provision of improved means for mounting sashes so that they may be readily swung into open position and so that when closed they will make an absolutely air-tight connection. A further object is to provide means by which the sash when closed will be held securely in this position and will not be allowed to open except by the application of a positive pressure on the sash, thus avoiding accidental opening thereof.

WATER-CLOSET SEAT.—M. D. HELFRICH, Evansville, Ind. The improvement relates, specifically, to the construction of water-closet seats and lids, etc., by laying a bolt or rod with nuts and washers at both ends square across the front end and rear end of seat and lid, so as to lap two or more joints with each bolt or rod and laying square across the grain of the wood and joints, which enables the inventor to make a seat and lid showing the grain or end wood entirely at front and rear end of seat and lid.

FOLDING-CHAIR.—J. H. STIGGLEMAN, Wabash, Ind. The object of the improvement is to provide a connecting bearing member adapted for pivotal connection with one leg of a folding chair and having a projecting flange adapted for engagement with a longitudinally-disposed slot in the adjacent crossed leg of the chair to permit the folding of the chair into a minimum of space and to permit the use of straight short legs connected near their lower ends with an ordinary round or reach.

CURTAIN-POLE.—J. KRODER, New York, N. Y. In this patent the invention relates to curtain-rods, curtain-poles, and similar fixtures; and the object of the inventor is the provision of new and improved means for removably fastening knobs, balls, or like end ornaments in position on the ends of a tube, pole, or similar fixture.

Machines and Mechanical Devices.

AMUSEMENT APPARATUS. — F. W. THOMPSON, New York, N. Y. This invention relates particularly to improvements in passage-ways through which people may walk, an object being to provide a device of this character so constructed as to have a vibratory motion in part, thus making it somewhat difficult for a person to walk through and affording amusement.

CIGAR-BUNCH-SHAPING MACHINE.—J. D. LACROIX, New Orleans, La. The aim of this improvement is to provide a shaping machine designed either for independent use or for use in connection with a cigar and cheroot bunch making or rolling machine and arranged for uniformly and properly shaping, forming, setting, and drying bunches in large quantities in a short time, giving a perfectly smooth surface to the bunches and without danger of breaking or injuring the binder, to facilitate wrapping by hand or machine, and to insure final production of a high-grade cigar or cheroot.

SHUTTLE-BINDER.—H. B. BECKMAN, Newburg, N. Y. Mr. Beckman has discovered that by making the shuttle-binder in such a manner that a part of the operating-surface is capable of yielding and another part rigid he can produce a device which is much lighter than the metal binders heretofore used and is also much more durable than wooden ones. This result he preferably accomplishes by making the binder in the form of a sort of skeleton frame consisting of two parts, one of which is straight and the other of which is curved and longer than the other. The invention relates to a shuttle-binder for looms.

CONVEYER FOR SOLID MATERIALS.—A. L. PUTNAM, New York, N. Y. The inventor's object is to provide for forcing such material as coal, grain, bricks, and small blocks of material of a general character through a pipe or duct to some predetermined spot. It is to be used to do the work for which chain-and-bucket or belt conveyers are now employed. The invention comprises one or more movable receptacles adapted to convey material to a discharge-duct and force it into the duct successively from the receptacles.

THREAD-SEPARATOR.—E. C. REITER, Rockville, Conn. Mr. Reiter's invention has reference to thread-separators and admits of general use, but is of peculiar service in quilling-machines and analogous devices in which it is desirable to separate a number of threads from each other and to maintain the separation.

PLASTIC-BLOCK MACHINE.—A. EVENSTAD, Lakota, N. D. While capable of use for molding various articles, this machine is especially adapted for molding hollow building-blocks. The objects of the invention are to secure the ready and accurate opening of the mold by a simple operation, at the same time providing for entirely removing the mold from the article produced, and also providing a very simple and easy manner of constructing the bottom plates and guiding the cores.

WEIGHT-INDICATOR FOR WEIGHING-SCALES.—D. F. CURTIN, Butte, Mont. Mr. Curtin's invention is in the nature of a simple attachment for scales for the use of grocers and others, which shall give notice when the approximate quantity of merchandise has been placed on the scales, so that the further addition of material to bring it up to the required quantity may be carefully regulated to avoid getting an overplus of material on the scales.

FILLING-MACHINE.—T. J. BROUGH, Baltimore, Md. In packaging granulated and pulverulent substances—such as tea, flour, and sulphur—and also in bottling liquids which are sticky and thick much difficulty is experienced owing to the material becoming packed or sticking in the hopper, so that it fails to deliver with sufficient freedom and rapidity. The inventor has devised an improved and highly-efficient means for agitating the material and causing it to flow from the hopper with due freedom, rapidity and uniformity.

Pertaining to Vehicles.

DRAFT-EQUALIZER.—C. WERNECKE, Genesee, Idaho. The object of the inventor is to provide an equalizer which is adjustable in its parts, whereby four draft-animals will be permitted to work abreast—one in the furrow and the others on the firm soil at the land side of the plow. Furthermore to provide details of construction for an equalizer which permit the use of three or five draft-animals working abreast, keep them spaced apart, and prevent side pull on the plow or draft device.

AXLE-NUT.—B. G. BUTLER, Sumter, S. C. The invention refers to axle-nuts such as used for retaining the wheels of vehicles upon the axles. The object is to produce a nut adapted to carry a quantity of oil or lubricant and provided with efficient means for supplying the rubbing surfaces with the lubricant. Arrangement is made for preventing waste of the lubricant and for facilitating replenishing of the same.

SUPPORT FOR VEHICLE-TOPS.—F. F. HEISELMANN, Hydepark, Ohio. The objects in this case are to provide details of construction for supporting-posts of a canopy which facilitate the vertical erection of the posts, permit their vertical adjustment, enable the attachment thereto of the canopy in a horizontal position, and furthermore, provide means for an attachment of side curtains upon the posts near their upper ends to permit lapping and securing of side curtains upon side edges of rear curtain, thus reinforcing the corners of these curtains where they engage, so as to strengthen them and more effectually exclude the elements during stormy weather.

APPARATUS FOR APPLYING OUTSIDE RUBBER TIRES.—C. ANDREVERT, 2 Rue du Bac, Ivry Port, Seine, France. The placing in position on wheels of vehicles of the outer covers and air-tubes of pneumatic tires, and particularly those having considerable diameter and size, is very difficult and requires relatively great force. Application of the outer cover to the rim is easily effected for about two-thirds of the circumference of rim. but very difficult to cause the remaining third to pass within the edge of the rim, within which the thickened edge or wire is lodged. The apparatus enables this inconvenience to be obviated and the outer cover to be placed in position on the rim without trouble and excessive strain. The apparatus is applicable to facilitate the placing in position on the rim of either a new or old outer cover.

Prime Movers and Their Accessories.

BOAT-PROPELLER.—J. SALOM, New York, N. Y. This invention refers to a device for propelling boats and other relatively small marine vessels by either manual or engine power: and the principal feature lies in an arrangement which enables the device to be easily and quickly applied to or removed from the transom of a boat. This adapts the mechanism particularly to boats to be frequently launched, and the principal advantage is that when the boat is hauled up on shore or in the davits of a vessel the propelling device may be removed from the transom and stowed safely away.

CURRENT-MOTOR.—W. NIEMEYER, St. Joseph, Mo. This invention refers to a motor for use upon rivers and other places where there is a current of water. The objects are to provide a device of this character which can be set up without the construction of costly masonry works and in which the operating device may be moved from the water without disconnecting any of the parts or lifting any of the heavy parts of the device out of the water.

ENGINE.—G. C. CANNON, New York, N. Y. The prime object of Mr. Cannon's invention is the provision of a valve-gear by means of which the speed of the engine may be absolutely controlled—that is to say, by which the engine may be run at any speed within the range between high and low speed. This he attains by a peculiar form of cam and by the arrangement of this cam in connection with the shaft and valve-stems.

ROD-PACKING.—C. L. COOK, Louisville, Ky. In this instance the invention relates to improvements in packings for piston-rods and shaftings of all descriptions, the object being to provide a metallic packing of novel construction that will effectually prevent the escape and consequent waste of steam or other motive agent.

VALVE FOR STEAM-ENGINES.—C. E. LOWE, Eufaula, Indian Ter. In the present patent the invention has reference to improvements in valves for steam-engines, the aim of the inventor being to provide a valve which will work with less friction than the ordinary slide-valve by doing away with stuffing-boxes and packing-glands for the valve-rod.

ENGINE.—G. H. COLLIER, Joplin, Mo. Mr. Collier's invention relates to a steam-engine having an oscillating piston arranged in a suitable chest or cylinder and joined by a connecting-rod with a crank-shaft, so as to rotate the shaft upon the oscillation of the piston. The chest is provided with feed and exhaust ports controlled by a slide or other valve driven from eccentrics on the crank-shaft.

Railways and Their Accessories.

FISH-BAR CLAMP.—W. S. WOOTTON, Roanoke, Va. This invention relates to means for securing fish bars or plates oppositely upon the webs of meeting track-rails of a railroad, so as to secure the rails alined and together, and has for its object to provide a novel and practical device for the indicated purpose that is easily applied and that dispenses with screw-threaded bolts and nuts thereon as means for clamping the fish bars or plates in place on the track-rails.

IMPLEMENT FOR ADJUSTING FISH-PLATE CLAMPS.—W. S. WOOTTON, Roanoke, Va. The invention refers to means for adjusting a securing device on fish-plates that are therewith clamped upon the meeting ends of track-rails, holding them alined, and has for its object more particularly to provide details of construction for an implement that is especially well adapted for adjusting the parts of a novel fish-bar clamp, the implement by its use enabling the fixture of the clamping device at a rail-joint in a convenient, speedy and reliable manner and facilitating removal of the fish-bar clamp as may be required.

CAR-WHEEL.—C. WIMMER, Hamilton, Canada. Mr. Wimmer's invention relates particularly to improvements in driving-wheels for locomotives, the object being to provide a wheel of novel construction so arranged as to have a comparatively large frictional bearing-surface lengthwise of a rail, thus reducing the danger of slipping to a minimum, and therefore causing a train to come to a quick stop upon setting the brakes and a quick and easy start.

LOCK FOR RAILWAY-SWITCHES.—D. BOYLE, Livingston, Mont. In the present patent the invention has reference to locks for railway-switches, and the inventor has for his particular object the provision of a secure device convenient to operate which will not be liable to become disarranged even if the associated switch-stand be overturned.

CAR-COUPLING.—J. MCWATTERS, St. Augustine, Fla. The object in this case is to provide details of construction for a coupling which will be very effective and reliable in service, convenient to operate, of compact construction, and which will positively release a car-coupling of the Janney type, whether of the improved or ordinary construction, when the car having the improved coupling thereon leaves the track from any cause and drops below the track-rails or the car in advance is derailed and its coupling is lowered.

CAR-COUPLING.—C. C. WERTHNER, Toronto, Canada. The purpose here is to provide a self-locking coupler adapted for either freight or passenger service and to so construct the coupler that uncoupling may be instantly and rapidly accomplished and whereby when two opposing draw-heads are brought together they will have a locking engagement, yet each draw-head and its draw-bar will be free to accommodate themselves to any curve, ascension, or declivity in the track.

Designs.

DESIGN FOR AN INCANDESCENT LAMP.—A. H. SELLING, New York, N. Y. This design for an incandescent lamp is graceful and ornamental. The lamp is provided with a conical illuminating surface corrugated so as to form a series of lines which converge at an apex and thus presents a maximum of illuminating surface. In form, the glass portion resembles the outline of a top.

DESIGN FOR FRINGE.—J. C. ATKINSON, New York, N. Y. This ornamental design for fringe comprises a band of linen or like threads, the threads producing a bright and checkered effect and studded with woven bows of unvarying size. Below the band the threads hang in graduated lengths to produce a scalloped form of edge. Mr. Atkinson has designed another ornamental fringe of like material as the above and consisting of a band with open work center. Below the band the threads hang in skein form of uniform length.

DESIGN FOR TRIMMING.—C. SEIDEL, New York, N. Y. This new and ornamental design for a trimming comprises a straight edged band of linen or like material. The body has a plain cross thread effect and irregularly spaced with stripes of different widths and two patterned rows, and forming a very chaste and attractive composition.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 6463.—For manufacturer of Flaherty Carboy Inclinator.

For mining engines. J. S. Mundy, Newark, N. J.

Inquiry No. 6464.—For manufacturer of suspender web, buckles, cord, etc., in large quantities; also a firm who would make a suspender on contract.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 6465.—Address of two or three firms dealing in small engines of one or two horse power.

Perforated Metals, Harrington & King Perforating Co., Chicago.

Inquiry No. 6466.—For manufacturer of cardboard rolls similar to those used for mailing periodicals, etc., also cardboard roll 5 in. long, 6½ in. in diameter and ⅛ in. wall.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 6467.—Address of manufacturers of a mill that will pulverize from 5 to 10 tons of hay or straw per day.

Adding, multiplying and dividing machine, all in one. Felt & Tarrant Mfg. Co., Chicago.

Inquiry No. 6468.—Address of people selling spool and bobbin machinery.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 6469.—For manufacturer of machine that will turn out the artificial target used by trap shooters and known as Blue Rocks, Black Birds.

Robert W. Hunt & Co. bureau of consultation, chemical and physical tests and inspection. The Rookery, Chicago.

Inquiry No. 6470.—For the manufacturer of collapsible hard tubes with screw cap suitable to put up ointment.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company Foot of East 138th Street, New York.

Inquiry No. 6471.—For the manufacturer of mortising chisel to use in a mortising machine, which removes the core, in making blind tenon doors, sash, etc.

I have every facility for manufacturing and marketing hardware and housefurnishing specialties. Wm. McDonald, 190 Main St., East Rochester, N. Y.

Inquiry No. 6472.—For the address of a firm who can supply a gasoline furnace adapted for heating bars of iron ¼ x 1 x 48 inches.

The SCIENTIFIC AMERICAN SUPPLEMENT is publishing a practical series of illustrated articles on experimental electro-chemistry by N. Monroe Hopkins.

Inquiry No. 6473.—For the address of parties manufacturing machine for forming heated bars into a helicoid form, like the blades of a lawn mower.

Sheet metal, any kind, cut, formed any shape. Die making, wire forming, embossing, lettering, stamping, punching. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 6474.—For the manufacturer of advertising novelties, especially woolen and celluloid rulers.

We manufacture gasoline motor and high-grade machinery, castings best quality gray iron. Select patterns, and let us quote prices. Frontier Iron Works, Buffalo, N. Y.

Inquiry No. 6475.—For importers of German and French mechanical toys, metal goods and novelties.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 6476.—For the manufacturer of machine used by the makers of felt roofing.

CALCULATING MACHINES.—Wanted, first-class firm willing to take up the agency and sale in the United States and Canada of a well-known calculating machine. Terms very favorable. Apply Grimme, Natalis & Co., Braunschweig, Germany.

Inquiry No. 6477.—For the manufacturer of typewriters, metal office furniture, typewriter ribbons, carbon papers, safes, sporting goods, canvas, car curtains, bookcases and office furniture.

WANTED.—General Factory Superintendent or Agent. Competent to take charge of large manufacturing plant. All correspondence strictly confidential. Address with full particulars as to experience and qualifications Superintendent. Box 773, New York.

Inquiry No. 6478.—For firms supplying bathroom outfits, a gasoline engine for pumping the water and an electric light outfit for about a dozen lights.

WANTED.—Revolutionary Documents, Autograph Letters Journals, Prints, Washington Portraits, Early American Illustrated Magazines, Early Patents signed by Presidents of the United States. Valentine's Manuals of the early 40's. Correspondence solicited. Address C. A. M., Box 773, New York.

Inquiry No. 6479.—For the manufacturer of small or portable furnace (oil burner preferred) for smelting ironore.

MANUFACTURERS OF NOVELTIES AND DEALERS.

WANTED to purchase up-to-date novelties suitable for mail order business.

The Agents Novelty Co.
89 Court St., Room 2,
Boston, Mass.

Inquiry No. 6480.—For manufacturers of desiccating machines.

Inquiry No. 6481.—For manufacturers of refrigerators 75 feet in length.

Inquiry No. 6482.—Wanted, catalogues of goods for export.

Inquiry No. 6483.—For parties dealing in collapsible tin or lead tubes with screw caps, such as are used to put up Winsor & Newton oil colors, Carter's and other pastes, blackings, etc.

Inquiry No. 6484.—Name and address of good glass worker to make a bent glass tube of special design.

Inquiry No. 6485.—For manufacturers of air hose, open blast, carpet and furniture tools, air hose connections and a small pressure blower.

Inquiry No. 6486.—Address of embroidery machine makers for simple pattern work, lockstitch principle (zig-zag or otherwise).

Inquiry No. 6487.—For manufacturer of ½ h. p. gasoline engines, water motors which can be tapped and water pipe in cellar like a meter without stopping the flow of water.

Inquiry No. 6488.—Address of firms handling new scientific toys, such as can be used in illustrating principles in Physics in an interesting way.

Inquiry No. 6489.—Address of parties handling violin maker's tools.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9528) M. L. T. asks: 1. In the so-called "Highlow" lamp, is the small loop of filament which is used for the small candle-power of a greater resistance than the large one? If so, what is its resistance in comparison with the large one? A. We do not know the resistance of the filaments of the "Highlow" lamp, but the resistance of the side which gives the least light must be much greater than that of the side which gives the brighter light. 2. Is a silk watch chain any protection to a watch from its being magnetized when being carried in the pocket? The first person claims that he wears a silk watch chain while working about a machine (which by the way is a 150-kilowatt rotary converter, 550 volts direct current) so that if it should hit the field casting, his watch would not receive the magnetism by its traversing the chain as it would if it were gold. I claim that the material of the chain would not affect the watch becoming magnetized, but if brought near enough to the machine, the watch would receive the magnetism, even if it were in the pocket. I have always read that magnetism had no insulator; according to this, I believe the silk chain to be no protection from magnetism. Will you please state your opinion of this? A. Your friend and yourself seem to be a little mixed in reference to magnetism, silk watch chains, etc. You are right that magnetism passes through space. It has no insulator, excepting iron. It does not traverse a wire at all. It whirls around a wire in which a current of electricity is flowing, and causes the current to move a magnetic needle, and thus makes voltmeters and ammeters possible. Silk on the other hand is an insulator of electricity, not of magnetism. Electricity cannot get off a wire covered with silk. Gold is a conductor of electricity, and if a gold watch chain touched any uninsulated metal which was carrying a current, a man who might touch the chain in that position would receive a shock. If such a chain should touch the field casting only, nothing could happen, since the field casting is not carrying a current of electricity, but is only magnetized.

(9529) J. A. H. asks: Will you kindly explain how voltmeters and ammeters can be read to 1-10 their divisions? A. A scale is usually read to a tenth of a division by estimating the fractional part in tenths with the eye. This is of course not accurate, but the best that can ordinarily be done. The error, with experience, need not exceed a tenth. Sometimes voltmeters and ammeters are provided with shunts, which change the value of a division of the scale. Thus you can have a shunt made which will make one division have one-tenth of its present value. This will be much better than to estimate by the eye the fractional part of a division indicated by the pointer.

NEW BOOKS, ETC.

THE BIBLE IN PRACTICAL LIFE. Being the Proceedings of the Second Annual Convention of the Religious Education Association, held in Philadelphia, Pa., March 2 and 4, 1904. Chicago: Executive Office of the Association, 1904. 8vo.; pp. 640.

The papers contained in this volume cover very completely the subject in hand. Many of them are by leaders in the religious thought of the country, and the information contained in the lectures will be found invaluable to all who have to do with the teaching and studying of the Bible.

THE NATURE OF THE STATE. By Dr. Paul Carus. Chicago: The Open Court Publishing Company, 1904. 12mo.; pp. 52. Price, 15 cents.

Dr. Carus is the author of a long list of works on religion and ethics. Seven papers are here presented dealing with the evolution of the state, its present condition and standing, its rights and its limitations.

CRANIO-MUSCULAR ORIGINS OF BRAIN AND MIND. By Philip H. Erbés. Chicago: Promethean Publisher, no date. 16mo.; pp. 240. Price, $1.20.

The author is well known in his special line, and he pretends to no exhaustive treatment of the evolutional origins of brain and mind. The author believes that it is only by conforming to reality, visible and invisible, that we can ever hope to place life and conduct upon a sound basis. The entire book is avowedly committed to carrying the law of evolution to the limit.

THE TELEPHONE SERVICE. Its Past, Its Present, and Its Future. By Herbert Laws Webb, M.I.E.E. London and New York: Whittaker & Co., 1904. 16mo.; pp. 118. Price, 40 cents.

The author is a well-known electrical engineer, and it has been his endeavor to describe in plain language the general features of a modern city telephone system, and the principles which govern the cost of production of the telephone service. The difficulties which arise in the working of the service are many, and this is chiefly responsible for the acrimony with which complaints against the telephone service are usually tinged. These discussions are, in many cases, marred by lack of knowledge on the part of the participants, not alone of the technical details, but of the fundamental principles of an extremely technical industry. It has been the aim of the author to try and convey intelligently to the lay mind the broad principles which underlie the telephone service, and in this he has succeeded most admirably.

LE TURBINE A VAPORE ED A GAS. By Giuseppe Belluzzo. Milan: U. Hoepli, 1905. 8vo.; pp. 413. Price, $2.50.

The author of this Italian treatise on turbines shows a remarkable familiarity with both the theory and practice of turbine engineering. He shows an excellent knowledge of the mathematical phase of the subject, and we doubt if there is any treatise in English which in any way approximates this work. We hope that it may soon be translated and given to English-speaking readers.

BUSINESS SHORT CUTS IN ACCOUNTING, BOOK-KEEPING, CARD-INDEXING, ADVERTISING, CORRESPONDENCE, MANAGEMENT. Detroit: The Book-Keeper Publishing Company, Ltd., 1904. 18mo.; pp. 157. Price, $1.

In the present volume we find short cuts in figures, calculations, accounting, advertising, correspondence, bookkeeping, filing, credits, collections, selling methods, etc. The expert systematizer is in greater demand than any other business expert. His is the most lucrative of the newest of all professions. He is welcome wherever he goes, and his large fees are seldom begrudged, because in the end he is a money-saver of large caliber. The present book is filled with admirable suggestions, which might be adopted with success by many concerns. The book has been arranged by the board of experts of the Book-Keeper and Business Magazine of Detroit, Mich.

THE NAVAL POCKETBOOK. By Sir W. Laird Clowes. London: W. Thacker & Co., 1904. Pocketbook size; 972 pp. Price, $3 net.

This little work is always welcome, and it divides the honors with the more pretentious books of Jane and Brassey. Special attention has been given to the submarine boats of the world. The notes on torpedoes are also interesting. The list of drydocks is most comprehensive, and the trial trip tables will certainly be of use to all who are in any way engaged in conducting such tests. The illustrations are numerous and accurate. The book is one that we can recommend as a concise compendium of naval matters.

THE FOUNDATION OF ALL REFORM. A Guide to Health, Wealth, and Freedom. By Otto Carqué. Chicago: Kosmos Publishing Company, no date. 18mo.; pp. 76. Price, 50 cents.

The present volume advocates the superiority of the fruitarian diet, and the book will undoubtedly prove of interest to those who are in favor of this diet.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending January 24, 1905

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Adding and subtracting machine, M. E. Anderson	780,853
Adjustable table, L. Stengel	780,829
Advertising device, M. L. Hinchman	780,883
Air and gas supply apparatus, J. E. Truckses	780,543
Air brake mechanism, H. N. Ransom	780,813
Amalgamator, J. B. Rossman	780,529
Animal trap, A. A. & E. H. Hoyt	780,659
Annulus, L. N. D. Williams	780,850
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Balance ball, W. H. Sargent	780,816
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Batteries, charging storage, J. L. Hall	780,564
Batteries, etc., mercury feeder for stamper, N. P. Carver	780,493
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Belt shifter, automatic, M. G. Gans	780,562
Binder, loose leaf, W. P. Pitt	780,618
Binder, temporary, S. H. McVitty	780,904

THE PRUDENTIAL

Stronger Financially, and in the Confidence of the Public, Than Ever Before

A Year of Greatest Gains in Progress, Security and Usefulness

Number of Policies
in force, nearly
6 Million

Increase in Number
of Policies in force, over
One-half Million

Paid Policyholders
during 1904, over
13 Million Dollars

Total Payments
to Policyholders, December 31, 1904, over
92 Million Dollars

Increase in Assets
over
16 Million Dollars

TWENTY-NINTH ANNUAL STATEMENT
JANUARY 1, 1905

ASSETS

BONDS AND MORTGAGES		$15,682,358.73
3309 All First Liens on Property, valued at	$40,882,977.19	
REAL ESTATE, owned by the Company		12,494,957.86
RAILROAD BONDS		27,681,596.87
MUNICIPAL AND MISCELLANEOUS BONDS		10,141,196.00
UNITED STATES GOVERNMENT BONDS		105,375 00
NATIONAL BANK AND TRUST COMPANY STOCKS		4,200,400.00
Total Market Value of above Bonds and Stocks.	$42,128,567.87	
Total Cost Value of above Bonds and Stocks.	40,697,570.44	
INCREASE IN VALUE OF BONDS AND STOCKS OVER COST	$1,430,997.43	
CASH IN 259 BANKS AND TRUST COMPANIES throughout the United States, and cash in office ($6,154,811.25 on Interest)		6,832,683.09
INTEREST AND RENTS, due and accrued		641,775.85
LOANS ON COLLATERAL SECURITIES		5,665,100.00
Bonds and Stocks, having Market Value of	$ 7,549,322.00	
Excess of Market Value over amount Loaned, showing margin of security of	1,884,222.00	
LOANS TO POLICYHOLDERS		2,427,950.12
On the security of their Policies—the Reserve Value on their Policies being	$ 4,427,238.00	
SEMI-ANNUAL AND QUARTERLY PREMIUMS not yet due, and Premiums in course of collection (Reserve charged in Liabilities)		2,888,911.65
Total Assets		**$88,762,305.17**

LIABILITIES

RESERVE Legal and Special	$73,954,919.00
Amount held to Protect Policy Contracts.	
ALL OTHER LIABILITIES	1,481,519 84
Policy Claims, including those in process of adjustment; Premiums paid in advance; Unearned interest on Policy Loans; Bills awaiting presentation for payment, etc.	
SURPLUS TO POLICYHOLDERS	13,325,866.33
Total Liabilities	**$88,762,305.17**

Cash Dividends
and other concessions, not stipulated in original contracts, and voluntarily given to holders of old Policies, to date, over
5 Million Dollars

Life Insurance Issued and Paid for during 1904, over 312 Million Dollars

Largest in the History of the Company

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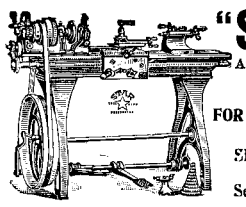
Incorporated as a Stock Company by the State of New Jersey

JOHN F. DRYDEN, President — Write for Information of Policies, Dept. 121 — Home Office, Newark, N. J.



"Star" Foot and Power Screw Cutting Automatic Cross Feed Lathes

FOR FINE, ACCURATE WORK

Send for Catalogue B.

SENECA FALLS MFG. CO.
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ENGINE & FOOT LATHES. MACHINE SHOP OUTFITS. TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

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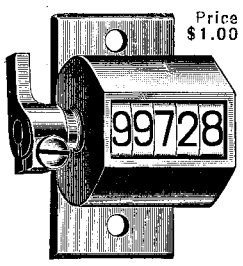

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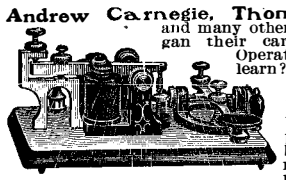

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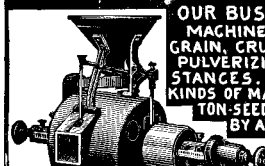

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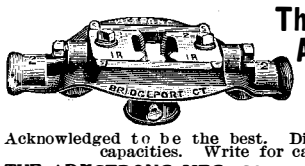

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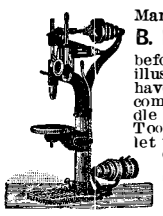

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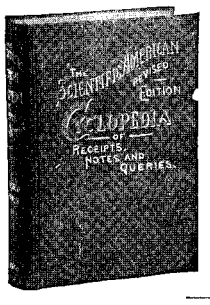

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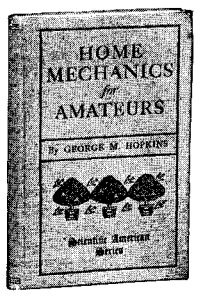

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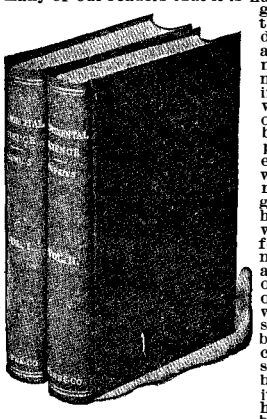

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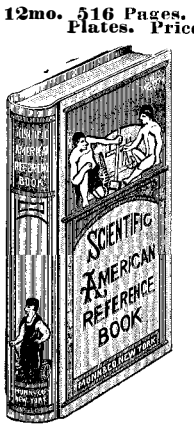

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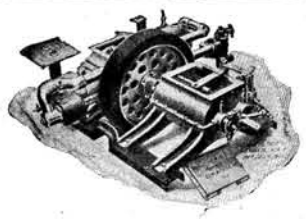

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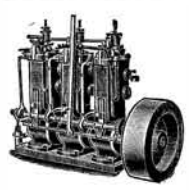

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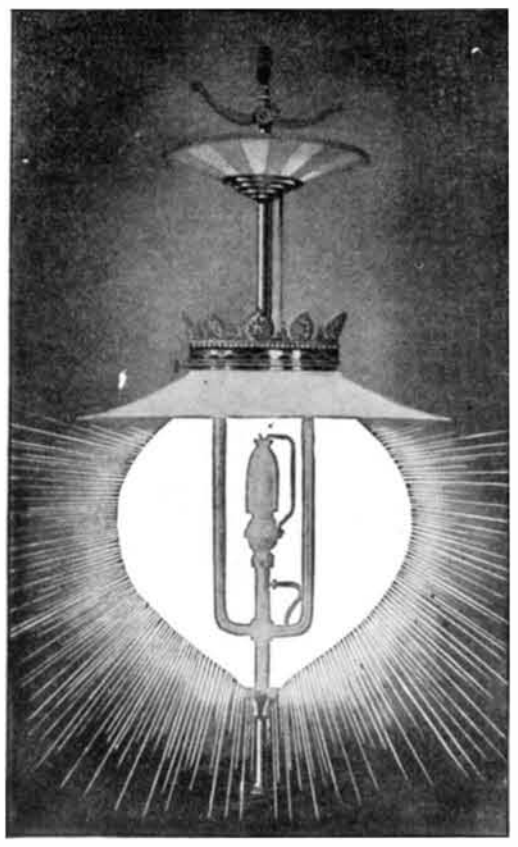

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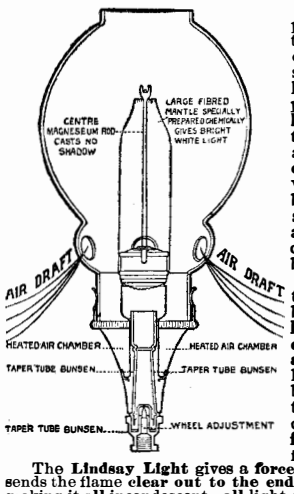

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Tenders for Deepening, Widening and Buoying St. George's Channel.

The Crown Agents for the Colonies, London, England, are prepared, on behalf of the Government of Bermuda, to receive tenders for the deepening, widening and buoying of the Channel leading from sea into St. George's Harbour in the Islands of Bermuda.

The Channel has been surveyed by persons appointed by the Government of Bermuda, and on and after the 27th of January, 1905, a plan, drawing, sections, form of contract and form of tender may be seen daily by intending contractors at the office of the British Consul-General, 17 State Street, between the hours of 11 A. M. and 3 P. M.

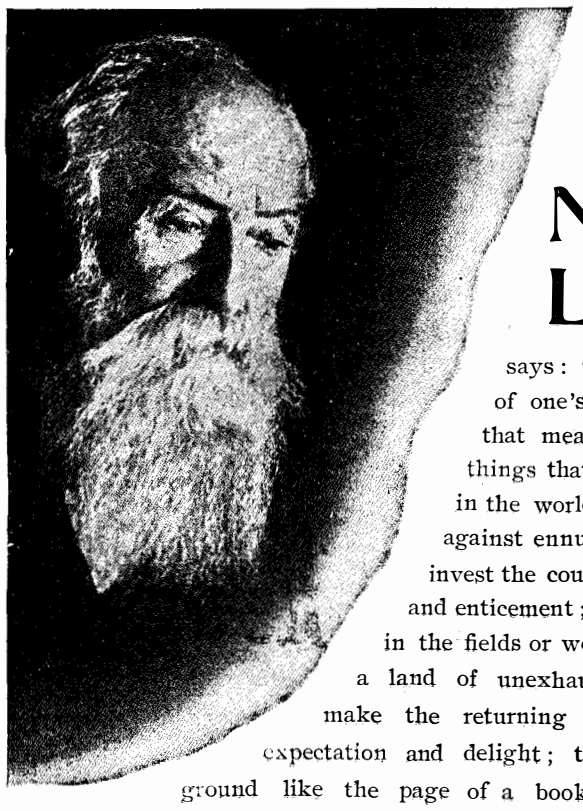
On application to the Consul-General and on payment of 20 pounds, persons or firms wishing to submit a tender will receive two copies of the form of contract and form of tender and will be allowed to make copies of the plan, drawings and sections showing the work to be executed under the contract. The above sum will be returned to each person or firm submitting a bona fide tender properly completed in all respects witnin the time specified below.

Tenders on the form attached to the form of contract must be delivered to the Crown Agents for the Colonies, Whitehall Gardens, London, S. W., not later than noon on Monday the 10th day of April, 1905, in sealed envelopes endorsed "Tender for deepening, widening and buoying St. George's Channel, Bermuda." The draft form of contract and schedule of prices must be sent in with the tender with the blanks in each properly filled in as required by the form of tender.

One of the conditions of the tender is that it must remain open and may be accepted at any time within six months.

The Crown Agents do not bind themselves to accept on behalf of the Government of Bermuda the lowest or any tender, nor will they assign any reason for the rejection of a tender.

The tenders will be communicated to the House of Assembly of Bermuda. The carrying out of the proposed works will depend mainly upon whether after the tenders have been submitted to the Legislature of Bermuda the Legislature decide to proceed with the works



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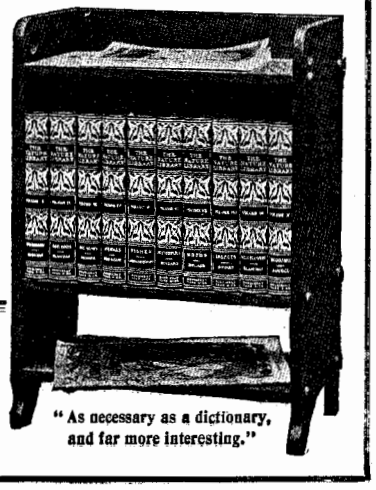

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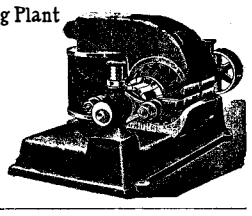

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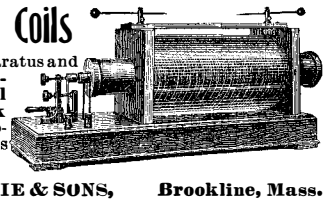

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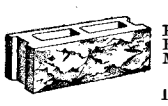

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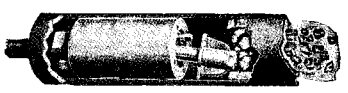

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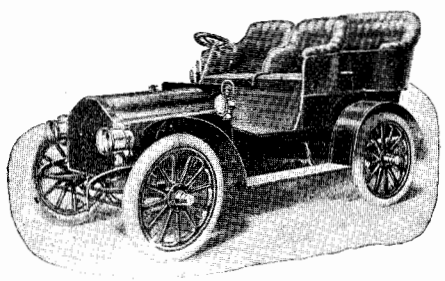

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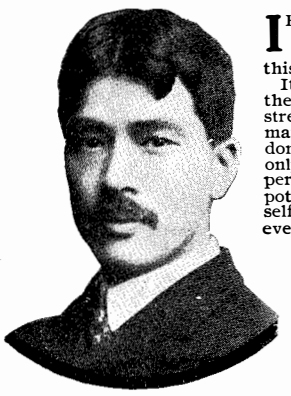

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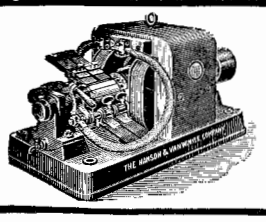

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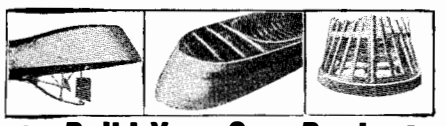

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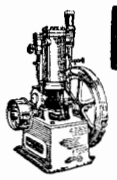

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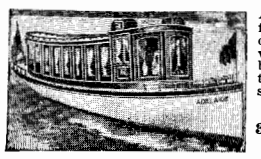

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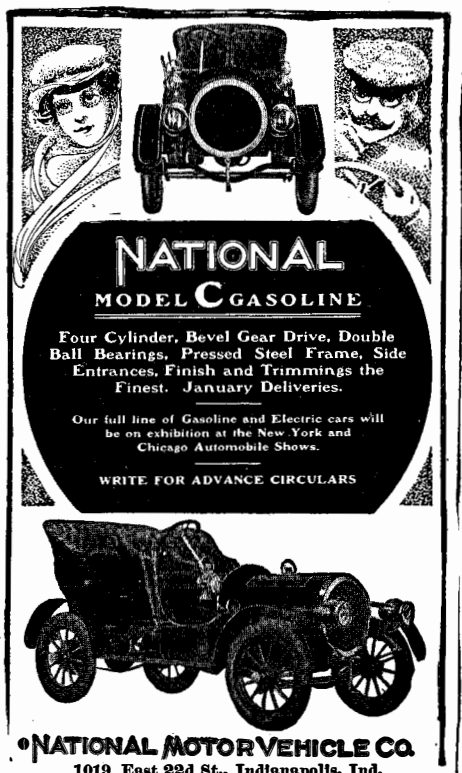
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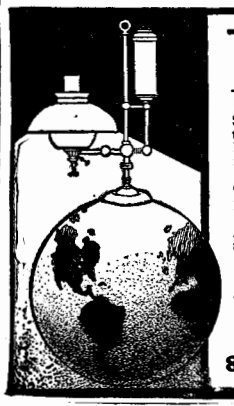

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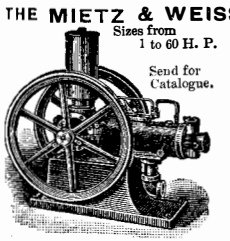

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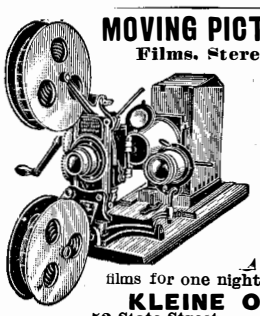

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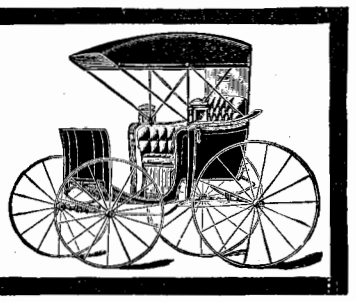

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